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THE  
PHILOSOPHICAL  
TRANSACTIONS

From the Year MDCC.

(Where Mr. *LOWTHORP* ends)

To the Year MDCCXX.

ABRIDG'D,

AND

Dispos'd under General HEADS.

---

By BENJ. MOTTE.

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VOL. II. Containing

Part III. The PHYSIOLOGICAL Papers.

Part IV. The PHILOLOGICAL Papers.

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L O N D O N:

Printed for R. WILKIN, R. ROBINSON, S. BALLARD,  
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TRANSACTIONS  
PHILLOSOPHICAL

From the Year 1700

(Where Mr. Lowthorpe ends)

To the Year 1702

ABRIDGED

AND

Disposed under General Heads

43375



VOL. II. Continuing

From the Year 1702 to the Year 1703

1703

Printed by W. Johnston, at the Press of the Royal Society, in Pall Mall



To the RIGHT HONOURABLE  
E D W A R D,  
L O R D  
H A R L E Y,



HIS Continuation of an ABRIDG-  
MENT, which appear'd under the  
Auspicious Protection of His  
NOBLE FATHER, is  
most humbly dedicated by

His LORDSHIP'S

*Obedient, Devoted,*

*Humble Servant,*

BENJ. MOTTE.

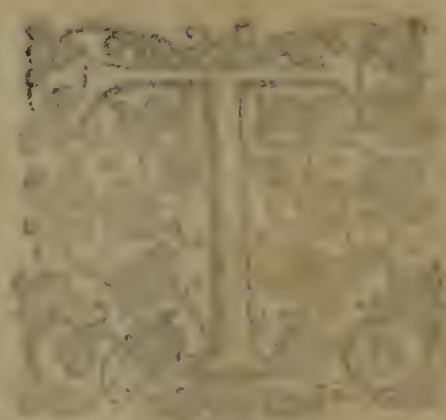
To the Right Honourable

EDWARD

and

HARLEY

HIS Commission of an Agent  
and what appears under the  
Augustus Proclamation of His  
NOBLE FATHER is



most faithfully collected by

His Majesty's

Surveyors

and

Surveyors





T H E

# Philosophical Transactions

From the Year 1700. to 1720.

Abridg'd and Methodically Digested.

P A R T III.

## The Physiological Papers.

C H A P. I.

Physiology, Meteorology, Pneumaticks.

I. A Scale of the  
Degrees of Heat.  
by ... n. 270. p.  
824.  
Calorum Descrip-  
tiones & signa.

0  
0,1,2  
2,3,4  
4,5,6  
6  
12  
14 <sup>3</sup>/<sub>4</sub>  
17  
20 <sup>2</sup>/<sub>11</sub>  
24

**C**ALOR aeris hyberni, ubi aqua incipit gelu rigescere. Innotescit hic calor accurate locando Thermometrum in nive compressa, quo tempore gelu solvitur.

Calores aeris hyberni.

Calores aeris verni & autumnalis.

Calores aeris æstivi.

Calor aeris meridiani circa mensem Julium.

Calor maximus quem Thermometer ad contactum corporis humani concipit. Idem circiter est calor avis ova incubantis.

Calor balnei prope maximus, quem quis manu immersa & constanter agitata diutius perferre potest. Idem fere est calor sanguinis recens effusi.

Calor balnei maximus, quem quis manu immersa & immobili manente diutius perferre potest.

Calor balnei quo cera innatans & liquefacta defervendo rigescit & diaphaneitatem amittit.

Calor balnei quo cera innatans incalescendo liquefcit & in continuo fluxu sine ebullitione conservatur.



28 $\frac{1}{2}$	2 $\frac{1}{4}$	Calor mediocris inter calores quo cera liquefcit & aqua ebullit.
34	2 $\frac{1}{2}$	Calor quo aqua vehementer ebullit, & miftura duarum partium plumbi, trium partium ftanni & quinque partium bismuti defervendo rigefcit. Incipit aqua ebullire calore partium 33 & calorem partium plusquam 34, ebulliando vix concipit. Ferrum verò defervescens calore partium 35 vel 36, ubi aqua calida, & 37 ubi frigida, in ipfum guttatim incidit, definit ebullitionem excitare.
40 $\frac{1}{2}$	2 $\frac{3}{4}$	Calor minimus quo miftura unius partis Plumbi, quatuor partium Stanni & quinque partium Bismuti incalefcendo liquefcit, & in continuo fluxu confervatur.
48	3	Calor minimus quo miftura æqualium partium ftanni & bismuti liquefcit. Hæc miftura calore partium 47 defervendo coagulatur.
57	3 $\frac{1}{4}$	Calor quo miftura duarum partium ftanni & unius partis bismuti funditur, ut & miftura trium partium ftanni & duarum plumbi; fed miftura quinq; partium ftanni & duarum partium bismuti hoc calore defervendo rigefcit. Et idem facit miftura æqualium partium plumbi & bismuti.
68	3 $\frac{1}{2}$	Calor minimus quo miftura unius partis bismuti & octo partium ftanni funditur. Stannum per fe funditur calore partium 72, & defervendo rigefcit calore partium 70.
81	3 $\frac{3}{4}$	Calor quo bismutum funditur ut & miftura quatuor partium plumbi & unius partis ftanni. Sed miftura quinque partium plumbi & unius partis ftanni ubi fufa eft & defervet in hoc calore rigefcit.
96	4	Calor minimus quo plumbum funditur. Plumbum incalefcendo funditur calore partium 96 vel 97 & defervendo rigefcit calore partium 95.
114	4 $\frac{1}{4}$	Calor quo corpora ignita defervendo penitus definunt in tenebris nocturnis lucere, & viciffim incalefcendo incipiunt in iifdem tenebris lucere, fed luce tenuiffima quæ fentiri vix poffit. Hoc calore liquefcit miftura æqualium partium Stanni & Reguli martis, & miftura feptem partium bismuti & quatuor partium ejufdem Reguli defervendo rigefcit.
136	4 $\frac{1}{2}$	Calor quo corpora ignita in tenebris nocturnis candent, in crepufculo vero neutiquam. Hoc calore tum miftura duarum partium reguli martis & unius partis Bismuti, tum etiam miftura quinq; partium reguli martis & unius partis Stanni defervendo rigefcit. Regulus per fe rigefcit calore partium 146.



161	$4\frac{3}{4}$	Calor quo corpora ignita in crepusculo proxime ante ortum solis vel post occasum ejus manifestocandent, in clara vero diei luce neutiquam, aut non nisi perobscure.
192	5	Calor prunarum in igne parvo culinari ex carbonibus fossilibus bituminosis constructo & absq; usu follium ardente. Idem est calor ferri in tali igne quantum potest candentis. Ignis parvi culinarius, qui ex lignis constat, calor paulo major est, nempe partium 200 vel 210. Et ignis magni major adhuc est calor, præsertim si folliibus cieatur.

In columna prima habentur gradus caloris in proportionem arithmetica, computum inchoando a calore quo aqua incipit gelu rigescere tanquam ab infimo caloris gradu seu commune termino caloris & frigoris, & ponendo calorem externum corporis humani esse partium duodecim. In secunda columna habentur gradus caloris in ratione geometrica sic ut secundus gradus sit duplo major primo, tertius item secundo, & quartus tertio, & primus sit calor externus corporis humani sensibus æquatus. Patet autem per hanc Tabulam quod calor aquæ bullientis sit fere triplo major quam calor corporis humani, & quod calor stanni liquefcentis sit sextuplo major, & calor plumbi liquefcentis octuplo major, & Reguli liquefcentis duodecuplo major, & calor ordinarius ignis culinarius sexdecim vel septemdecim vicibus major quam calor idem corporis humani.

Constructa fuit hæc Tabula ope Thermometri & ferri candentis. Per Thermometrum inveni mensuram calorum omnium usq; ad calorem quo stannum funditur, & per ferrum calefactum inveni mensuram reliquorum. Nam calor quem ferrum calefactum corporibus frigidis sibi contiguis dato tempore communicat, hoc est, calor quem ferrum dato tempore amittit, est ut calor totus ferri. Ideoq; si tempora refrigerii sumantur æqualia, calores erunt in ratione geometrica, & propterea per tabulam logarithmorum facile inveniri possunt.

Primum igitur per Thermometrum ex oleo lini constructum inveni quod si oleum ubi Thermometer in nive liquefcente locabatur occupabat spatium partim 10000, idem oleum calore primi gradus seu corporis humani rarefactum occupabat spatium 10256, & calore aquæ jamjam ebullire incipientis spatium 10705, & calore aquæ vehementer ebullientis spatium 10725, & calore stanni liquefacti defervientis ubi incipit rigescere & consistentiam amalgamatis induere spatium 11516 & ubi omnino rigescit spatium 11496. Igitur oleum rarefactum fuit ac dilatatum in ratione 40 ad 39 per calorem corporis humani, in ratione 15 ad 14 per calorem aquæ bullientis, in ratione 15 ad 13 per calorem stanni defervientis ubi incipit coagulari & rigescere, & in ratione 23 ad 20 per calorem quo stannum deferviens omnino rigescit. Rarefactio aeris æquali calore fuit decuplo major quam rarefactio olei, & rarefactio olei quasi quindecim vicibus major quam rarefactio spiritus vini. Et ex his inventis ponendo calores olei ipsius rarefactioni proportionales & pro calore corporis humani scribendo partes 12, prodiit calor aquæ ubi incipit ebullire partium 33, & ubi vehementius ebullit partium 34; & calor stanni



stanni ubi vel liquefcit vel defervendo incipit rigescere & consisten-  
tiam amalgamatis induere prodiit partium 72, & ubi defervendo rigescit  
& induratur partium 70. His cognitis, ut reliqua investigarem, calefeci  
ferrum satis crassum donec satis canderet, & ex igne cum forcipe etiam  
candente exemptum locavi statim in loco frigido ubi ventus constanter  
spirabat; huic imponendo particulas diverforum metallorum & aliorum  
corporum liquabilium notavi tempora refrigerii donec particula omnes  
amissa fluiditate rigescerent, & calor ferri æquaretur calori corporis hu-  
mani. Deinde ponendo quod excessus calorum ferri & particularum  
rigescentium, supra calorem atmosphæræ Thermometro inventum, essent  
in progressionem geometrica ubi tempora sunt in progressionem Arithmetica,  
calores omnes innotuere. Locavi autem ferrum, non in aere tranquillo  
sed in vento uniformiter spirante ut aer a ferro calefactus semper abripe-  
retur a vento, & aer frigidus in locum ejus uniformi cum motu succe-  
deret. Sic enim aeris partes æquales æqualibus temporibus calefactæ  
sunt & calorem conceperunt calori ferri proportionalem. Calores  
autem sic inventi eandem habuerunt rationem inter se, cum caloribus  
per Thermometrum inventis, & propterea rarefactiones olei ipsius calo-  
ribus proportionales esse recte assumpsimus.

Observations on  
the Dissolutions  
and Fermentati-  
ons which we may  
call Cold, by Mon-  
sieur Geoffroy  
N. 274 p. 951.

II. The Mixture of the greatest part of the Salts in many Liquors is  
accompanied with a sensible Coldness of the Liquors, notwithstanding  
the prompt and violent Fermentations which follow many of these  
Mixtures. I have distinguish'd the Dissolutions or Mixtures into two  
Classes. In the former I comprehend all the Simple Cold Dissolutions;  
that is to say, Those Dissolutions which are not accompanied with  
any sensible Ferment. The second takes in only the cold Ferments,  
or Dissolutions of Salts, which are accompanied with a sensible Ferment,  
and a Coldness of the Liquor.

Of Simple Cold  
Dissolutions.  
Dissolutions of  
Salts salted in  
common Water.

Class 1. I put a Pint of common Water into a Viol, and an ordinary  
Thermometer of 18 Inches in the Water, and so let it lie some time to  
fit itself in proportion to the Temperature of the Water. I afterwards  
put into the Water 4 Ounces of *Sal Armoniac*, and the Liquor of the  
Thermometer descended two Inches and 9 Lines, in less than a quarter  
of an Hour. Observing the same Circumstances, I made the same Ex-  
periment with Salt-Peter, and the Liquor of the Thermometer descend-  
ed one Inch 3 Lines. The same Experiment being made with Vitriol,  
the Liquor of the Thermometer descended almost an Inch. Sea-Salt  
made the Liquor descend but 2 Lines. And all the Salts being to be  
put in very lightly, I thought it the hardest Matter to pour it in  
aright.

Dissolution of  
Alkali Volatil  
Salts in common  
Water.

All the Alkali Volatile Salts cooled the common Water by their  
Mixture, causing the Liquor of the Thermometer to descend by some  
Lines: But I observed that they caused it (to do so) more or less, ac-  
cording as they were more or less purified: And the Salt of Urine seem'd  
to do so soonest of all.



As for the Alkali Lixivious Salts, they were so far from cooling the Water in which they were mingled, that they heated it more or less, according as they were Calcined better or worse. Upon the whole, one may observe that the Salts for heating Water ought to be purely Alkalous. For if they approach near the nature of Nitre or Sea-Salt, they Heat the Water but a little, or not at all, if they do not rather cool it. This is also done very considerably by the Salt of Tamarisc, extracted from the *Lixivium* of the Ashes of this Vegetable.

*Alkalous Lixivious Salts excepted from the general Rule, because that some of them do Heat in their mixture with Water.*

*Sal Armoniac* mingled with the Acids of Vegetables, as distilled Vinegar, Juice of Limons or Verjuice, gave no mark of a Ferment, but cool'd these Liquors very much. An Ounce of *Sal Armoniac* cast into 4 or 5 Ounces of Distilled Vinegar caused the Liquor of the Thermometer to descend 2 Inches 3 Lines. The same Salt, mixed with the Juice of Limons, caused the Liquor to descend 2 Inches. It does the same with Verjuice. These are the mixtures of Salts with Liquors, which seem'd most remarkable, by reason of the Cold which they excited.

*Salts salted, mixed with the Acids of Vegetables.*

*Class 2.* Salt-Peter cast into its Acid Spirit raised some Smoke or Vapours, and caused the Liquor of the Thermometer to descend 4 Lines. Salt-Peter, mixed with Spirit of Vitriol, exhaled Smoke in great quantity, and caused the Liquor to descend from 6 to 7 Lines. In these two Experiments I put half an Ounce of Salt upon 3 Ounces of Liquor.

*Of Cold Fermentations. Salts salted, mixed with Acid Spirits.*

I put half an Ounce of *Sal Armoniac*, into 3 Ounces of Spirit of Nitre, and the Liquor of the Thermometer descended 2 Inches 5 Lines. This Mixture put forth some Vapours, which seem'd more considerable than those which do ordinarily exhale from Spirit of Nitre alone. I poured half an Ounce of *Sal Armoniac* into 3 Ounces of Spirit of Vitriol, which made a violent Fermentation. The Subject Matter was considerably raised, and much Vapour went out, the Liquor was very thick, and the Thermometer descended 3 inches 6 lines. I observed, that the Vapours which were raised by this Mixture were Hot, and that they considerably raised the Liquor of the Thermometer, which I held hanging above the Subject Matter, tho' that which was dipp'd within did descend, and shew'd a very great Cold.

Sea-Salt mixed with Acid Spirits, Heats the Liquors, instead of cooling them. Being mixed with Spirit of Salt, it raised the Liquor of the Thermometer some Lines, without shewing any sensible Ferment. With Oil of Vitriol it ferments with a Noise, and raises a great Smoke: The Liquor thickens, and becomes a sort of a clear Jelly. The Liquor of the Thermometer rises very much in this Mixture, and the Heat is sensible to the Touch.

*Sea-Salt excepted.*

All the Volatile Alkalous Salts mingled with different Acid Liquors, excited a Ferment more or less strong, according to the Acidity of the Liquors, and the Purification of these Salts from their Fetid Oils. They all made the Liquor of the Thermometer to descend: but that which did so the most considerably, is the Salt of Urine. One Ounce of Volatile Salt

*Volatile Alkalous Salts mingled with Acid Spirits.*



*Fixed Salts purely  
Alkalous excepted.*

Salt of Urine very well Rectify'd, in 4 Ounces in Distilled Vinegar, made a strong Fermentation. The Substance is elevated very much, and with Noise; and the Liquor of the Thermometer descends in the Ferment one inch 9 lines. One Ounce of Volatile Salt of Urine, in 3 Ounces of Spirit of Vitriol, raised a violent Ferment, during which the Liquor of the Thermometer descended 2 inches 4 lines. The mixture of Salt of Tartar, or other fix'd Alkalous pure Salts, with Acid Liquors excited Fermentations with Heat.

I made all these Experiments with the same Thermometer, when the Weather was sufficiently Cold, and the Temperature of the Air equal enough.

*Reason of the  
Cold and Dissolu-  
tion of Salts.*

As to the Reason of these Experiments, I first of all examined the simple Cold Dissolutions, and having (with all Physicians) fixed this Principle, That Cold is nothing but the Diminution of Motion; I say, that the Coldness which the Salts bring to the Water, seems to be occasion'd from this, that the Salt Particles being without Motion, and dividing that Liquor, diminishes it so much the more. This (is that) which produces the Cold greater or less in the same Liquor.

*Why the Thermo-  
meter rises a little,  
the Dissolution  
being made.*

There is one thing to be observed, which is, that some time after the Dissolution is made, the Liquor of the Thermometer rises again a little. Which may be occasioned by this, that the subtil matter which glided abundantly between the liquid Particles, had ceas'd to glide there in the same quantity for some time, the gross Particles of the Salts opposing themselves against their Passage; but these Saline Particles being divided by little and little, they opened again the Passages to the subtil Matter. This gave to the Liquor more Motion than it had at the beginning of the Dissolution; but yet less than it had when it was pure and without Mixture; the Saline Particles, altho' dissolv'd, abating somewhat of their Motion.

*Whence proceeds  
the Heat of the  
Dissolutions of  
Lixivious Salt.*

We may easily comprehend why Lixivious Salts, purely Alkalous and well Calcin'd, as also the Salt of Tartar do heat the Liquor, and are very far from Cooling it, if we consider that these Salts in the strong Calcination which they have undergone, are loaded with many fiery Particles which they hold, as it were in Prison in their Pores. These igneous Particles regain their Liberty by the Dissolution of the Saline Particles. And in the same time that these Salts ought to slacken the Motion of the Aqueous Particles, and cool it, the igneous Particles being very active, do augment the Agitation of the watry Particles, till they make it very hot.

*Great Coldness of  
Sal Armoniac  
even to Freezing.*

I observe next, that *Sal Armoniac* cools the Water wherein it is Dissolved, more than any other Salt. Its Cold equals that of Water which is ready to Freeze. And it happen'd one time, that in dissolving a good quantity of this Salt in Water, some Drops which fell on the outside of the Viol in which I made the Dissolution did Freeze, and the Straw upon which the Viol stood, being wet, was fastned to the Glass Vessel, for some time, by the Ice. This fell out since the Summer, at a

time



time when the Weather was warm. I have many times since tryed the same Experiment, in different Ways, but without ever being able to produce the Ice. Chance had apparently made me meet, in this Experiment, not only a very exact Proportion between the Salt and the Water, but also a Temperature in the Water besides, which I suppose necessary: because the Dissolution being quick, the Coldness must also be more sudden and great: and this is that Degree of Temperature to which I could never afterwards attain.

The great Coldness of the Dissolution of *Sal Armoniac* proceeds not from any Difficulty which it has to be dissolv'd, since it dissolves sooner than any other. And Sea-Salt, whose Dissolution is difficult and very slow, is that which does least cool its Dissolver. On the contrary, it seems that the Facility and Readiness with which it dissolves, may be the Cause of this great Cold, in this manner. *Sal Armoniac*, as every body knows, is a Composition of Sea-Salt and Salt of Urine, the one very easy, the other very hard to dissolve; the Particles of Sea Salt being, as it were, imprison'd among the Particles of the Salt of Urine; it comes to pass, that many of the Aqueous Particles, penetrating at first dash the Saline Particles of the Urine, do there immediately lose much of their Motion; and this Motion grows weaker by so much the more, as the Aqueous Particles meet afterwards with Saline Particles of another Nature, whose Resistance is much more considerable, than that of the Salts of Urine. So in the first Instance of the Dissolution, the Motion of a great quantity of Aqueous Particles being very much abated all at once, by the Salts of Urine, and by the Sea-Salt; it excited, in a few Moments, a Cold far greater than the Cold of other Dissolutions of Salts, which the Water does not penetrate so readily. It may be Objected, That the Sea-Salt being the hardest to dissolve, its Dissolution would be also the Coldest. To which I answer, That this might be if the Water could penetrate suddenly into all its Parts: but the Slowness with which it penetrates them, because of the close Texture of the *Molecules* of this Salt, does hinder that the Diminution of the Motion of the Parts of the Water, can't be so ready, nor by consequence so great: Whereas in *Sal Armoniac*, the Parts of the Sea-Salt being extended by the Salt of Urine, the Pores of the Alkalous Salt of Urine are like so many Ways open to the Parts of the Water, for going to penetrate the Parts of the Sea-Salt in numberless Places.

I place in the Rank of Cold Dissolutions, the following Experiment which Monsieur *Homborg* made some time ago, before the Society. Take a Pound of Corrosive Sublimate, and a Pound of *Sal Armoniac*; powder them, each apart; then mix both the Powders very exactly, put the Mixture into a Viol, pouring upon it a Pint and half of distilled Vinegar, shaking it well together. This Composition will be so very Cold, that a Man can hardly hold the Vessel in his Hands in Summer. And it chanced as Monsieur *Homborg* was making this Mixture, that the Subject froze. We see in this Experiment a Cold yet

*Reasons of the Coldness.*

*Experiment of a Saline Dissolution excessively cold.*



yet greater than that in the Dissolution of *Sal Armoniac* alone in common Water. And this Cold is caused by the Corrosive Sublimate, which alone is not at all, or at least very little Dissoluble in distilled Vinegar. So that the fluid Parts of the distilled Vinegar, having quickly penetrated the Parts of the *Sal Armoniac*, and having already lost a great deal of their Motion; engaging afterwards in the Pores of a Body which they could not dissolve, and having Action not more than enough for that, they do there lose that little Activity which they had. They coagulate there, if not at all, at least the greatest part: and this want of Action is the cause of that great Cold which we perceive there.

Explications of  
Cold Ferments.

In order to shew the Reason of Cold Ferments, I own (with the Physicians) that Heat and Cold in Liquors are neither more nor less than Motion in the little Parts of these Liquors, caused by the continual current of the Subtil Matter in the Spaces which these Particles do leave between them. And I affirm, that every time this Motion is diminished, and when the Course of the Subtle Matter is interrupted, the Liquor appears less Hot or more Cold. This being supposed, if we do attend to that which happens in Cold Fermentations, we shall observe on the one Hand for the most part, very considerable Coagulations, and a very sensible Thickening of the Liquors: on the other Hand, we shall perceive a very violent Agitation of some of the Parts of these mixtures: Many Vapours are exhaled, the Matter swells, sends out many Bubbles and Ferments with Noise. And in this manner I conceive that all these Effects are produced.

In the mixture which I made of Salts with Acid Liquors, the greatest part of the Liquor coagulating with a part of the Salts, its Motion was much abated in a little time; but, its Parts not being able to coagulate, without stopping or weakning the current of the subtil matter, this matter finding the Passages shut up, takes its Course by the Interstices, which remained between the coagulated Particles, where the Passage was yet free; and, as it glided away in a quantity together, it caused a very considerable Agitation in the Parts which it met with in its Passage. 'Tis this Agitation which causes the Fermentation which we perceive: 'Tis this which raises the Bubbles of Air and the Smoke: 'Tis this which puffs up and swells the matter with so much the more Violence, as all the parts of the Liquor being almost half coagulated, do hinder the Motion and Agitation of these little Particles. Nevertheless this Agitation, how violent soever it may appear, is not considerable enough to break the Coagulum intirely, which is formed in the Liquor, nor consequently to overcome the Cold, which causes this Coagulation. All it can do, is to preserve yet some kind of Fluidity. In short, the more these mixtures are dispos'd to coagulate, the more they excite the Cold. This we may see in the mixture of *Sal Armoniac* with Oil of Vitriol, in which the Coagulum becomes so strong, that at last, it forms above the Liquor a very thick Saline Crust. In the mixture of other Salts with weaker Acids, as in the mixture of Volatil Salts with Spirit



Spirit of Vinegar, the Coagulum can hardly be perceived; nor is the Cold so considerable as in the former. I add farther, That even the violent Agitation which this mixture causes, being not universal, and passing no farther than some few places of the Liquor; it may for all that, contribute to the great Coldness in the mixture of Sal Armoniac and Oil of Vitriol, in encreasing the Coagulum, so that the little Particles which are violently agitated in this Mixture, being not able to draw along with them in their Motion the Coagulated parts which are too gross; they drive them away from the Center of their Motion: So that these Particles almost half coagulated, being got amongst these little Whirl-pools, and press'd one against another, they stick close to one another, coagulate still more strongly, and lose their Motion entirely; which causes a very great cold. If any Man can scarce persuade himself that the violent Agitation in some parts of the Mixture does contribute to the Coldness of the Liquor, he may be convinced by the following Experiment.

I put some cold Water into a great Basin, I put into the middle of the Water a Cucurbit of Glass full of Water equally cold, I put into the Cucurbit a very good Thermometer, which I let lie a good while for a Tryal. When it was adjusted to a Degree proportionable to the Cold of the Water, I threw suddenly into the Water in the Basin four or five Shovels full of Coals well kindled; and in an instant, the Liquor of the Thermometer descended 2 or 3 lines. After some Moments, the Liquor rose again, when the Heat of the Water in the Basin was communicated to the Vessel of Glass.

*Experiment of  
Water cooled by  
Fire.*

The Cold of the Water of the Cucurbit can't be attributed to any thing besides the Pression or sudden Condensation which the Fire caused in the Water, wherein it was put. Which Condensation may be explain'd in this manner. In the Instant that the burning Coals were thrown into the Water, the Vortex of the Subtil Matter by which it was turn'd round, being press'd by the Water which environed it, scatter'd with Violence all the Particles of the Water. This scattering being made all at a time in many Places of the Water in the Basin all round the Vessel of Glass: All the Particles which environ'd the Vessel, being at once press'd on all Sides, were condensed considerably and successively. The Vessel being in the Center of Pression, bore all the weight of this Pression, as well as the Liquor which contained it. And this Liquor lost by its Condensation very much of the Motion of the Liquid, which it had before, which was considerable enough to cause the Liquor of the Thermometer to fall. This Cold goes off quickly, because all the Water in the Basin being very much heated, it quickly heats also that in the Vessel of Glass.

*Reason of this  
Experiment.*

As for the sensible Heat of the Vapours which rise from the Mixture of Sal Armoniac with Oil of Vitriol; it is not difficult to find the Cause; if we consider that these Vapours are but the most subtil and active Parts of this Mixture, which the subtil Matter raises within it crossing it.

*Reasons of the  
Hot Vapours  
from the Cold  
Ferment caus'd  
by the mixture  
of Sal Armoniac  
and Oil of  
The Vitriol,*



The Motion of these Particles is free in the Air ; it is but more repressed by the too gross coagulated Particles. It becomes by so much the more violent, by how much it has been retain'd and hindred for some time ; and is perceived by Heat, which is the ordinary Effect of rapid and violent Motion.

*Change of the Cold Ferment from the mixture of Sal Armoniac and Oil of Vitriol, into a very hot Ferment with a little Water.*

If after having made the Mixture of 4 Ounces of Oil of Vitriol, and an Ounce of *Sal Armoniac*, one throws upon it a spoonful of common Water, in the time when the Fermentation is strongest, the Cold is greatest, and the Thermometer falls with the greatest Quickness ; the Ferment ceases, and the Cold changes immediately into a great Heat, and makes the Liquor of the Thermometer to rise very high. One may easily conceive the Reason of this Experiment, if we consider that the Water heating quickly and strongly with the Oil of Vitriol, makes here the same Effect. And this Heat is sufficiently great at that time to destroy the Cold of the coagulated Particles, the Water by it self being otherwise very proper to dissolve this *Coagulum*.

*A New Thermometer, ib. p. 962.*

III. It is compos'd of a Bowl or Bottle of Glass, which has no opening, but by a little Tunnel at the end ; and which descends to the bottom. This Tunnel is open at both ends, B C. B dips into the Liquor E which is at the bottom of the Bowl. The space of the Bottle of Glass is fill'd with Air, which has no Communication with the Exterior Air. When the Air contained in this space is rarefy'd by the exterior Air which touches the Bottle, it presses at the same time the Liquor E, and obliges it to rise by B in the Tunnel B C. On the contrary, when it Condenseth by the exterior Cold, by not pressing the Liquor E, it permits that which is in the Tunnel to fall. The Readiness with which the Air Condenses or Rarefies by Cold and to Heat, makes the Effects of this Thermometer much more sudden than those of any other sort. Besides, the Effects of this is much greater, the Air being more capable of a great Rarefaction, or of a great Condensation, than any other Liquor.



Thermo-  
meter.

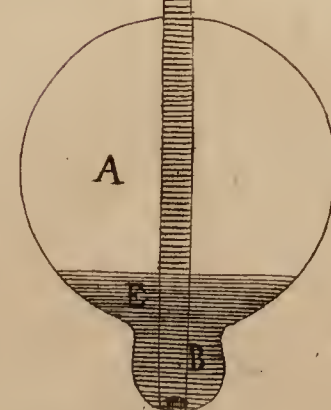


Fig. 3.

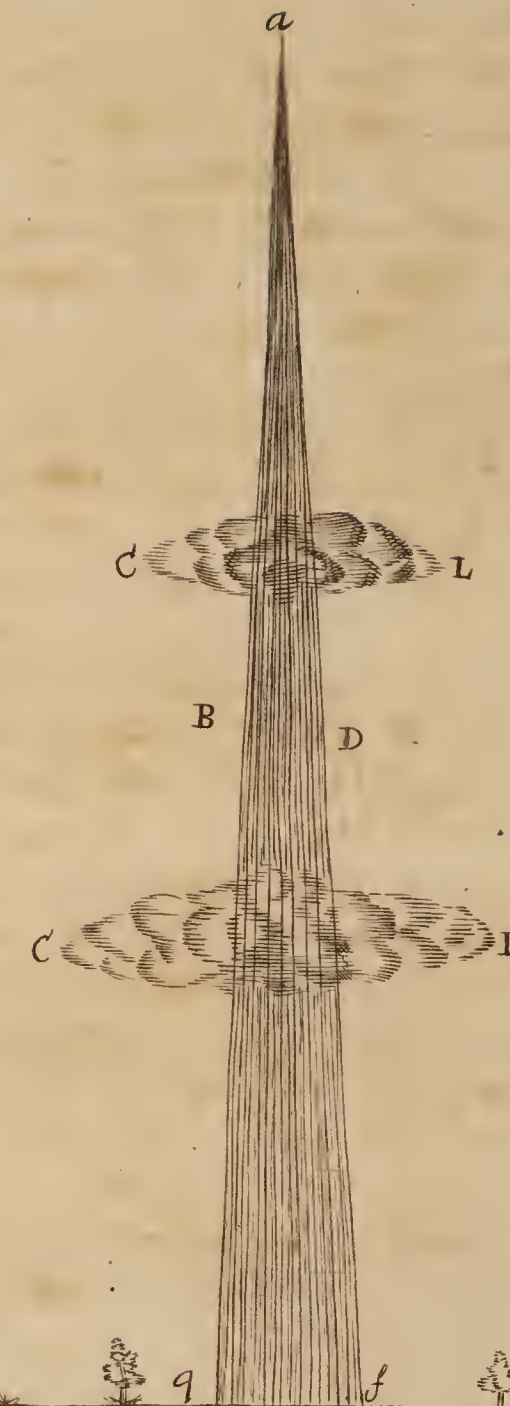


Fig. 2.

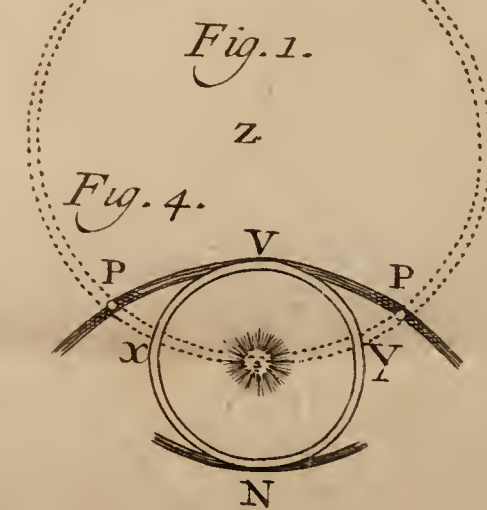
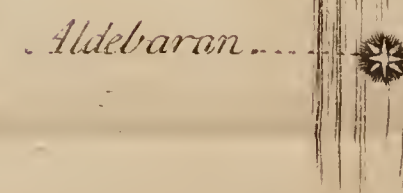


Fig. 1.

Fig. 4.





IV. Columna prima notat Aerem in Tubo 32 digit. Parisin. longo, 2 linn. diametro, relictum. Secunda altitudinem Mercurii supra Argenti vivi superficiem; Tertia spatia Aeris expansi. Quarta notat descensum Mercurii propter Aerem relictum.

I. Barometrical Experiments in Switzerland, by Dr. Scheuchzer. n. 344. p. 266.

D. 6. Septembr. Tiguri, Barometri totius altitudo hor. 8. ant. erat 26 digit. Parisiens. 4 linn. H.  $9\frac{1}{2}$  vero 26 digg.  $4\frac{1}{2}$  linn.

Col. I. digg.	Col. II. digg.	lin.	Col. III. digg.	lin.	Col. IV. digg.	lin.
3	19	9 bis	12	$6\frac{1}{2}$ bis	6	$7\frac{1}{2}$
6	16	8	15	$7\frac{1}{2}$	9	$8\frac{1}{2}$
9	16	$7\frac{1}{2}$	15	8	9	9
12	11	11 bis	20	3 bis	14	$5\frac{1}{2}$
15	9	9 bis	22	6 bis	16	$7\frac{1}{2}$
18	7	$5\frac{1}{2}$	24	$8\frac{1}{2}$	18	11
	7	6	24	8	18	$10\frac{1}{2}$
21	5	3	27	0 bis	21	$1\frac{1}{2}$
24	3	3	28	11 bis	23	$1\frac{1}{2}$
27	1	6	30	$7\frac{1}{2}$ bis	24	$10\frac{1}{2}$
30	0	4	31	$10\frac{1}{2}$ bis	26	0

D. 11. Sept. in Pascuo Alpino Ennensien gen. Avern Montis Liberi, Glaronensis ditionis, h. 1. pom. cœlo fereno. Altitudo totius Barometri 23. 10. bis.

D. 12. Sept. h. 7. ant. cœlo fereno, auff Scherf jugo editiore Montis Liberi. Altitudo totius Barometri 21. 8.

Col. I. digg.	Col. II. digg.	lin.	Col. III. digg.	lin.	Col. IV. digg.	lin.	Col. I. digg.	Col. II. digg.	lin.	Col. III. digg.	lin.	Col. IV. digg.	lin.
3	18	7	13	6	5	3	3	17	6	14	6	4	2
6	15	$7\frac{1}{2}$	16	4	8	$2\frac{1}{2}$	6	14	7	17	3	7	1
9	13	3	18	7	10	7	9	12	6	19	6	9	2
12	11	$1\frac{1}{2}$	20	9	12	$8\frac{1}{2}$	12	10	5	21	6	11	3
15	9	0	22	9	14	10	15	8	5	23	6	13	3
18	6	11	25	0	16	11	18	6	5	25	3	15	3
21	4	11	26	10	18	11	21	4	7	27	1	17	1
24	3	0	28	10	20	10	24	2	$9\frac{1}{2}$	29	$0\frac{1}{2}$	18	$10\frac{1}{2}$
27	1	4	30	5	22	6	27	1	4	30	6	20	4
30	0	2	31	8	23	8	30	0	2	31	8	21	6



D. 12. Sept. h. 9. ant. cœlo sereno,  
auff dem Blattenstoek jugo  
editiore Montis Liberi. Alti-  
tudo tot. Barom. 21. 6.

Col. I. digg.	Col. II. digg. lin.	Col. III. digg. lin.	Col. IV. digg. lin.
3	17 2 $\frac{1}{2}$	14 6	4 3 $\frac{1}{2}$
6	14 5	17 5	7 1
9	12 4	19 6	9 2
12	10 4 $\frac{1}{2}$	21 5	11 1 $\frac{1}{2}$
15	8 7	23 4 $\frac{1}{2}$	12 11
18	6 7	25 3	14 11
21	4 8	27 3	16 10
24	2 9	29 0	18 9
27	1 3	30 5	20 3
30	0 3	31 6	21 3

D. 14. Sept. h. 12. intra ipsam  
Venam Chalybis Sarunetanam,  
300. incirca passus ab ostio, cœlo  
foris sereno. Barometri totius  
altitudo 24. 4. & 24. 3.

Col. I. digg.	Col. II. digg. lin.	Col. III. digg. lin.	Col. IV. digg. lin.
3	18 9	13 1	5 7
6	15 9	16 1	8 7
9	13 5	18 5	10 11
12	11 3	20 7	13 1
15	9 1	22 9	15 3
18	7 0	24 10	17 4
21	4 11	27 0	19 5
24	3 0	28 10	21 4
27	1 4	30 6	23 0
30	0 3	31 6	24 1

Extra Venam metallicam sub dio eandem altitudinem observavi Mercurii in Barometro integro, item in 3 & 9 digg. Aeris in tubo relictæ. Sed notandum est aerem in intimis fodinæ partibus, ubi experimenta feci, fuisse ob ignem præterito die accensum (quo venam durissimam coquunt fossiores) rarefactum, & locum hypocaufti instar moderatè calefactum.

A Remark

by--ib.p.268.

N. B. Multis experimentis coram R. Societate factis compertum est, Aeris compressi vires Elasticas esse ut pondera comprimentia directè. His Cl. Scheuchzeri observatis patet eandem in Aere rarefacto obtinere regulam quam proxime; Nam licet differentia aliqua reperiatur, tanta non est, ut ab inæqualitate diametri Tubi non facile oriatur. Ut autem experimenta hæc rite fiant, oportebit Tubi capacitatem, immisso unciatim Mercurio, in æquales partes diyidi, loco partium longitudine æqualium.



V. A Table shewing, at an easy View, the Heights of the Mercury in the Barometer in English Inches and Centesimals of an Inch, both at Zurich in Switzerland, and at Upminster in South-Britain, together with the Difference of those Heights, throughout the Year 1708.

*The Barometrical Altitudes, Weather, &c. at Zurich, by Dr. Scheuchzer, at Upminster, by Mr. Derham, and at Pilsa, by Dr. Tilly, compar'd by Mr. De ham. n. 321. p. 342.*

January.				February.				March.			
D. of Mo.	Zurich in Engl. Inches.	Upm. in Engl. Inches.	Differ. in Engl. Inches.	Zurich in Engl. Inches.	Upm. in Engl. Inches.	Dif. in Engl. Inches.		Zurich in Engl. Inches.	Upm. in Engl. Inches.	Dif. in Engl. Inches.	
1	28 1	29 4	I 3	28	29 59	I 59		27 90	29 22	I 32	
2				8	52	I 44		28	23	I 23	
3	17	14	97	17	53	I 36		27 85	42	I 57	
4	26	43	I 17	17	39	I 22		82	64	I 83	
5	17	42	I 25	25	37	I 12		28	73	I 73	
6	I	28	I 27	17	44	I 27		12	44	I 32	
7	17	43	I 26	12	35	I 23		6	73	I 67	
8	27 99	5	I 6	8	40	I 32		27 81	30 12	2 31	
9	64	28 78	I 14	40	67	I 27		81	29 46	I 65	
10	46	50	I 4	15	87	I 72		85	18	I 33	
11	46	97	I 51	14	30 2	I 88		75	30	I 55	
12	99	29 38	I 39	27 90	22	I 12		81	50	I 69	
13	73	23	I 50	83	29 67	I 84		85	59	I 74	
14	73	11	I 38	28	49	I 49		85	45	I 60	
15	27 99	28 99	I	27 83	45	I 62		28 6	37	I 31	
16				84	47	I 63		13	47	I 34	
17	28 17	29 19	I 2	81	32	I 51		8	52	I 44	
18	8	28 89	81	27 95	33	I 38		27 90	33	I 43	
19	27 90	29 3	I 13	81	36	I 55		28 6	21	I 15	
20	90	15	I 25	28	25	I 25					
21	81	28 80	99	17	8	91		27 85	34	I 49	
22	73	95	I 22	38	41	I 3		72	8	I 36	
23	99	29 12	I 13	35	48	I 13		72	13	I 41	
24	90	20	I 30	17	47	I 30		85	6	I 21	
25								81	34	I 53	
26				20	25	I 5		75	29	I 54	
27	81	57	I 66	15	22	I 7		85	16	I 31	
28	81	95	2 14	27 95	28 99	I 4		28 4	38	I 34	
29				85	94	I 9		27 90	37	I 47	
30								95	6	I 11	
31	28 08	76	I 68					28	14	I 14	



April.				May.			June.		
D. of M.	Zurich in Eng. Inches.	Up. in English Inches.	Dif. in English Inches.	Zurich in English Inches.	Upm. in English Inches.	Dif. in English Inches.	Zurich in Engl. Inches.	Upm. English Inches.	Dif. in English Inches.
1	28	28 97	0 97	28 0	29 53	I 53	27 95	29 65	I 70
2	27 95	94	0 99	6	69	I 63	28 6	55	I 49
3	90	29 28	I 38				27 81	86	2 5
4	81	53	I 72	8	50	I 42	83	30 7	2 24
5	90	45	I 55	0	44	I 44	85	29 96	2 11
6	85	65	I 80	8	41	I 33	90	69	I 79
7	90	65	I 75	6	36	I 10	28 8	52	I 44
8	28	50	I 50				27 90	50	I 60
9	00	60	I 60	26	62	I 36	90	56	I 66
10	27 64	62	I 98	12	63	I 51	28 0	56	I 56
11	75	77	2 2	0	46	I 46	27 90	58	I 68
12	72	62	I 90	27 90	66	I 76	28 6	59	I 53
13	90	80	I 90	81	79	I 98	27 81	36	I 55
14	28	91	I 91	75	83	2 8	85	49	I 64
15	6	89	I 83	72	68	I 96	90	60	I 70
16	8	88	I 80	54	66	2 12	85	47	I 62
17	27 95	93	I 98				28 3	44	I 41
18	95	85	I 90	64	44	I 80	27 81	40	I 59
19	28	89	I 89	72	58	I 86	81	47	I 66
20	6	88	I 82	90	74	I 84	85	73	I 88
21	6			28 0	81	I 81			
22	8	30	I 92	0	59	I 59	90	70	I 80
23	00	29 80	I 80	27 95	54	I 59	97	70	I 73
24				28 8	67	I 59	85	43	I 58
25	8	80	I 72	17	80	I 63	96	45	I 49
26	12	85	I 73	15	86	I 71			
27				27 85	84	I 99	72	81	2 9
28	6	76	I 70	28 8	81	I 73	73	99	2 26
29				0	87	I 87	72	98	2 26
30	00	37	I 37	0	84	I 84	75	80	2 5
31				27 90	78	I 78			



July.				August.			September.		
D. of M.	Zürich in Engl. Inches.	Upm. in Engl. Inches.	Differ. in Engl. Inches.	Zürich in Engl. Inches.	Upm. in Engl. Inches.	Differ. in Engl. Inches.	Zürich in Engl. Inches.	Upm. in Engl. Inches.	Differ. in Engl. Inches.
1	28	29 72	1 72	27 85	30 2	2 17	28 6	29 58	1 52
2	27 95	92	1 97	81	29 84	2 3	00	54	1 54
3	97	89	1 92	85	70	1 85	17	50	1 33
4	95	80	1 85	28 6	72	1 56	8	48	1 40
5	28	67	1 67	10	67	1 57	27 72	61	1 89
6	27 75	69	1 94	8	56	1 48			
7	81	72	1 91	0	57	1 57	72	45	1 73
8	28	69	1 69	27 81	93	2 12	72	49	1 77
9	8	68	1 60	85	98	2 13			
10	12	80	1 68	90	62	1 72	81	45	1 64
11	0	84	1 84	95	66	1 71			
12	27 81	90	2 9	28 8	89	1 81	64	67	2 3
13	93	83	1 90	0	93	1 93	46	48	2 2
14	28 6	68	1 62	27 85	93	2 8	72	43	1 71
15				75	84	2 9	85	28 65	0 80
16				72	80	2 8			
17	27 95	63	1 68	73	55	1 82	72	29 30	1 58
18	90	77	1 87	72	19	1 47	69	67	1 98
19	28	76	1 76	90	61	1 71			
20	27 72	84	2 12	95	81	1 86	72	88	2 16
21	28	66	1 66	72	93	2 21	75	86	2 11
22	6	50	1 44	81	77	1 96	75	85	2 10
23	17	56	1 39	90	93	2 3	75	96	2 21
24	8	84	1 76	95	53	1 58	81	30 20	2 39
25	6	73	1 67	28 00	51	1 51	56	17	2 61
26				00	51	1 51	50	12	2 62
27	27 95	82	1 87	27 95	52	1 57	64	89	2 25
28	85	54	1 69	85	63	1 78	81	94	2 13
29	95	66	1 71	28	51	1 51			
30	85	61	1 76	27 85	62	1 77	72	73	2 1
31	81	96	2 15	28 6	56	1 50			



October.				November.			December.		
Day of M.	Zurich in Engl. Inches.	Upm. in Engl. Inches.	Differ. in Engl. Inches.	Zurich in Engl. Inches.	Upm. in Engl. Inches.	Differ in English Inches.	Zurich in Engl. Inches.	Upm. in English Inches.	Differ. in English Inches.
1	27 72	29 92	2 20	28 22	30 21	1 99	28 26	29 36	1 10
2	69	93	2 24	24	18	1 94	30	45	1 15
3							22	50	83
4							27 99	28 96	0 97
5	72	73	2 1	15	6	1 91	73	92	1 19
6	85	30 5	2 20	08	12	2 4	77	29 11	1 34
7				17	29 86	1 69	85	11	1 26
8	81	29 94	2 13				99	15	1 16
9				22	30 8	1 86	28 15	24	1 9
10	72	86	2 14	17	10	1 93	15	24	1 9
11	64	86	2 22	22	29 78	1 56	08	28	1 20
12	72	30 6	2 34				27 99	40	1 41
13				22	30 10	1 88	90	59	1 69
14	90	29 41	1 51	17	00	1 83	73	83	2 10
15									
16				22	15	1 93			
17	87	79	1 92	26			75	74	1 99
18	28 6	59	1 53				90	77	1 77
19	00	49	1 49	22	29 88	1 66	95	52	1 57
20	27 72	70	1 98				99	60	1 61
21	72	30 00	2 28	22	50	1 28	28 6	61	1 55
22	90	2	2 12				6	50	1 44
23	95	29 76	1 81	27 77	27	1 50	27 99	77	1 78
24	95	74	1 79	90	60	1 70	28 17	28	1 11
25	64	89	2 25	28 17	84	1 67	26	36	1 10
26	85	80	1 95				17	30 14	1 97
27	81	67	1 86				22	28	2 26
28	81	63	1 82						
29	28 00	64	1 64				17	29 83	1 66
30	27 90	80	1 90	26	45	1 19	15	80	1 65
31	28 00	73	1 73					49	1 32



*A Table of the Rain at Pisa in Italy, both in Tuscan, and English Troy-Weight, which fell through a Tunnel of half a Brace Square, from May till the end of December 1707. As also the quantity of Rain at Upminster in Essex at the same time, which fell through a round Tunnel of 12 Inches Diameter, in Pounds Troy, and Centesimals of a Pound.*

May.				June.				July.			
D. of M.	Pisa Rain in Tuscan Weight.	Pisa Rain reduced to Eng. W.	Rain at Upminster.	Rain at Pisa in Tuscan Weight.	Pisa Rain reduced to Engl. W.	Rain at Upminster.	Pisa Rain in Tuscan Weight.	Pisa Rain reduced to Eng. W.	Rain at Upminster.		
	l. oz.	l. dec.	l. dec.	l. oz.	l. dec.	l. dec.	l. oz.	l. dec.	l. dec.		
1						0 17			0 1		
2						2 90					
3						0 05			0 92		
4									0 40		
5									0 25		
6						0 55	2 0	1 84			
7											
8				5 7	5 12						
9											
10						0 06					
11						0 02			0 60		
12									1 12		
13									0 3		
14											
15						0 29					
16									0 17		
17									0 16		
18							0 3	0 23			
19											
20											
21											
22	0 90	69	2 70						0 94		
23			1 26						0 65		
24			0 17			0 85					
25						0 42					
26											
27						0 32			0 92		
28						0 23			0 20		
29			0 56								
30			0 56			0 81					
31	Tot.wt.	0 69	5 25		5 12	6 68		2 76	37		
	Dep. Inch.	0 12	1 05		0 88	1 34		0 35	1 27		

D

August



August.				September.				October.							
D.	Pisa of M.	Pisa Rain in Tuscan Weight.	Pisa Rain re- duced to Engl. Po.	Rain at Up- minster.	Rain at Pisa in Tuscan Weight.	Pisa Rain re- duced to Engl. wt.	Rain at Up- minster.	Rain at Pisa in Tuscan Weight.	Pisa Rain re- duced to Eng. wt.	Rain at Up- min- ster.					
	l.	oz.	l.	dec.	l.	oz.	l.	dec.	l.	oz.	l.	dec.			
1															
2	I	I	I	0	I	90					2	54			
3								4	8	4	28				
4				0	76										
5				0	09						0	69			
6				3	34		0	51							
7				0	16			7	7	6	96				
8				0	45		0	02							
9				0	81		0	04							
10							I	40	I	9	I	61			
11					0	5	0	38	0	70					
12								2	3	2	06				
13				0	10	0	4	0	31	0	51				
14				0	07	2	11	2	68	0	06				
15								3	10	3	52				
16								I	8	I	53				
17				I	68										
18							0	10							
19	32	5	29	75	0	10		0	87						
20	I	8	I	53	I	02	3	8	3	36					
21					7	9	7	11	I	65		I	62		
22					10	09	18								
23					3	2	2	91			0	80			
24	I	4	I	23	6	10	6	27	2	73	0	26			
25									0	85					
26									0	46					
27									2	76					
28											0	71			
29					5	10	5	35							
30				0	31				I	84					
31				0	9										
Total wt.				33	51	10	88	37	55	14	50	19	96	6	62
ep. in Inch				5	76	2	176	6	45	2	90	3	4	33	24



November.				December.			
Day	Rain at of Pisa in M. Tuscan Weight.	Pisa Rain re- duced to Eng. W.	Rain at Up- min- ster.	Rain at Pisa in Tuscan Weight.	Pisa Rain re- duced to Eng. Po	Rain at Up- min- ster.	
	l. oz.	l. dec.	l. dec.	l. oz.	l. dec.	l. dec.	
1							
2				2 8	2 45	0 44	
3			0 33			0 65	
4							
5							
6						0 63	
7						0 25	
8				5 44	4 89		
9	9 4	8 57				0 84	
10				2 10	2 60		
11							
12				2 8	2 45	1 67	
13							
14			0 53				
15						1 24	
16				3 10	3 52	0 96	
17			0 32				
18							
19	3 9	3 44					
20				5 65	5 5	0 82	
21			0 86			1 38	
22						0 22	
23	9 5	8 64				0 25	
24	0 6	0 46	3 08				
25	2 4	2 14				0 16	
26			0 28	3 22	2 91		
27	1 5	1 30		7 36	6 65	0 62	
28						1 98	
29				7 56	6 80		
30			0 50			0 03	
31							
Total wt.		24 55	5 90		37 32	12 14	
Dep. in In.		4 22	1 18		6 39	2 428	

D 2

A



*A Table of the Rain at Zurich in Switzerland, at Pisa, and Upminster, in the Year 1708. All reduc'd to the Depth in English Inches, and Centesimals of an Inch.*

D. of Mo.	January.					February.				
	Rain at Zurich.	Rain at Pisa.		Pisa Ra. reduced.		Rain at Zurich.	Rain at Pisa.		Pisa Ra. reduced.	
	Inches.	l.	oz.	l.	oz.	Inches.	l.	oz.	l.	dec.
1		5	8	5	20					
2	I					2	$\frac{1}{2}$	3	3	2 98
3										
4		7	26	58	0 97	I	$\frac{3}{4}$			
5	I				0 29		$\frac{3}{4}$	0	10	0 76
6					0 7	2				0 2
7										
8						2				
9		6	35	74	0 53		2	4	2	14
10					2 48		I	8	I	53
11					I 26					
12						2	$\frac{1}{2}$	0	9	0 69
13					I 91					
14		3	43	6	I 88					
15	4				0 4		$\frac{1}{2}$			0 18
16					0 92					
17		5	65	5		I	$\frac{3}{4}$			
18		2	92	52	I 26					
19						4	$\frac{1}{3}$			
20	I $\frac{1}{2}$						$\frac{1}{6}$	2	I	I 90 0 54
21	I									0 51
22	4				0 91					
23	2						7	2	6	58 0 64
24	2	3	63	21						
25	I $\frac{1}{2}$				I 7					0 19
26					0 80					
27		4	13	75						
28							2	9	2	52
29	$\frac{1}{2}$						$\frac{1}{8}$			0 22
30										
31		2	52	22						
Tot.	18 $\frac{1}{2}$			37 33	14 39	18 $\frac{3}{4}$			19 10	2 30
Dep.	I 64			6 41	2 878	I 65			3 28	0 46



March.					April.				
Day of Mo.	Rain at Zurich. Inches.	Rain at Pisa. l. oz.	Pisa Ra. reduced. l. dec.	Rain at Upm. l. dec.	Rain at Zurich. Lines.	Rain at Pisa. l. oz.	Pisa Ra. reduced. l. dec.	Rain at Upm. l. dec.	
1	2 $\frac{1}{2}$				9 $\frac{3}{4}$			1 16	
2						2 10	1 68	0 16	
3					7 $\frac{3}{4}$	2 4	2 14		
4						0 9	0 69		
5								1 54	
6				1 27					
7					1				
8					3				
9								0 16	
10				0 38	1 $\frac{1}{4}$			0 24	
11				0 37	$\frac{3}{4}$				
12	3 $\frac{1}{2}$							0 85	
13		8 17	40	0 37	$\frac{1}{3}$				
14									
15	$\frac{1}{2}$								
16					4 $\frac{3}{4}$				
17					5 $\frac{1}{2}$	0 10	0 76		
18		6 35	74		3 $\frac{1}{8}$				
19	2 $\frac{3}{4}$			0 25		2 21	1 99		
20				0 8	5				
21				0 20					
22				1 37					
23	2 $\frac{1}{8}$			1 06	6				
24				1 37	$\frac{1}{2}$				
25				1 43	3 $\frac{1}{2}$				
26	$\frac{3}{4}$				$\frac{1}{3}$				
27				1 29					
28				0 15				0 65	
29				0 54				0 01	
30	1 $\frac{1}{2}$								
31	3 $\frac{1}{2}$	2 6	2 29						
Tot.	17 $\frac{1}{8}$		15 43	10 13	52 $\frac{3}{4}$		7 26	4 96	
Dep.	1 51		2 65	2 3	4 69		1 25	0 96	



May.					June.		July.		
Day of	Rain at Zurich.	Rain at Pila.	Pila Ra reduced.	Rain at Upm.	Rain at Zurich.	Rain at Upm.	Rain at Zurich.	Rain at Upm.	
Mo.	Lines.	l. oz.	l. dec.	l. dec.	Lines.	l. dec.	Lines.	l. dec.	
1					I $\frac{1}{2}$		I	0 06	
2						0 66			
3				I 09	2I $\frac{3}{4}$		2 $\frac{1}{2}$		
4		5	I 4	66				0 03	
5				0 27	2 $\frac{1}{2}$				
6		4	4 3	98			25 $\frac{1}{2}$		
7		3	I 0	3 52		0 60			
8				0 82	I $\frac{3}{4}$	0 20		0 93	
9				0 II		0 90		0 49	
10						0 II		0 59	
11								0 47	
12	I $\frac{3}{4}$					I 66		0 01	
13				0 32	$\frac{1}{2}$	0 15		0 II	
14	$\frac{1}{3}$					0 76			
15	2 $\frac{1}{3}$			I II	3 $\frac{3}{4}$			I 00	
16				0 82				0 16	
17	$\frac{1}{3}$			0 01		0 01			
18				0 96		0 93	3		
19	5 $\frac{3}{4}$					0 04			
20	3 $\frac{1}{4}$				19		2 $\frac{2}{3}$		
21				0 53		2 66		0 01	
22				0 79	I				
23						I 23			
24					6 $\frac{1}{4}$	0 80		0 01	
25		3	4 3	06		0 44		0 41	
26					I $\frac{1}{4}$	0 38	$\frac{3}{4}$		
27	2 $\frac{1}{4}$					$\frac{1}{2}$	$\frac{3}{4}$	I 20	
28									
29	I						$\frac{1}{6}$	0 04	
30		2	I 0	2 60	6 $\frac{3}{4}$	0 08			
31	4 $\frac{1}{2}$	I	8 I	53			3		
Tot	21 $\frac{1}{2}$		19 35	10 II	66 $\frac{1}{2}$	II 61	39 $\frac{1}{2}$	5 52	
Dep.	I 91		3 33	2 02	5 91	3 32	3 50	I II	



August.			September.			October.			November.			December.		
D. of Mo.	Rain at Zurich. Lines.	Rain at Upm. l. dec.	Rain at Zurich. Lines.	Rain at Upm. l. dec.	Rain at Zurich. Lines.	Rain at Upm. l. dec.	Rain at Zurich. Lines.	Rain at Upm. l. dec.	Rain at Zurich. Lines.	Rain at Upm. l. dec.	Rain at Zurich. Lines.	Rain at Upm. l. dec.		
I												0 10		
2						0 03						0 61		
3				0 74								0 08		
4				0 06				0 92				0 27		
5						0 08			17 $\frac{1}{2}$					
6				0 64										
7		3 38	2											
8			7 $\frac{3}{4}$	0 40							0 30			
9			4 $\frac{1}{4}$								0 66			
10				0 05										
11		0 07		0 01	4 $\frac{1}{2}$			2 22						
12				1 41		0 06	$\frac{3}{4}$	0 26						
13						0 37			8					
14			5 $\frac{3}{4}$	1 24		0 16								
15			2 $\frac{3}{4}$	1 10										
16														
17		1 05									0 54			
18	3 $\frac{3}{4}$	0 56	7 $\frac{3}{4}$	0 29		0 31					1 84			
19														
20														
21					13 $\frac{1}{2}$						1 22			
22														
23	27 $\frac{3}{4}$			0 27		0 02	6 $\frac{3}{4}$				4 00			
24		0 15									0 22			
25	1 $\frac{1}{4}$	0 76												
26					6 $\frac{3}{4}$									
27		0 31	3 $\frac{3}{4}$											
28						0 06								
29	2 $\frac{1}{2}$	1 32		0 99										
30	$\frac{1}{4}$			0 08				0 90		$\frac{1}{2}$				
31		7 10			2 $\frac{3}{4}$	0 05			3 $\frac{1}{2}$					
Tot.	35 $\frac{1}{2}$	14 70	34	7 28	27 $\frac{1}{2}$	2 14	7	4 30	29 $\frac{1}{2}$	9 84				
Dep.	3 15	2 94	3 02	1 46	2 44	0 223	0 62	0 86	2 62	1 97				



*A Prospect of all the Rain in the foregoing Tables, in every Month, Half Year, and the whole Year, from June 1. N. S. or May 21. O. S. 1707. to the end of the Year 1708.*

	Depth of the Pisa Rain.	Depth of the Upm. Rain.	Depth of the Zurich Rain.
	Engl. Inch.	Engl. Inches.	Englisch Inches.
May.	0 12	1 05	
June.	0 88	1 34	
July.	0 36	1 27	
August.	5 76	2 18	
September.	6 45	2 90	
October.	3 43	1 33	
November.	4 22	1 18	
<i>The Half Years Rain.</i>		21 22	11 25
December.	6 39	2 43	
Anno 1708.			
January.	6 41	2 88	1 64
February.	3 28	0 46	1 65
March.	2 65	2 03	1 51
April.	1 25	0 96	4 69
May.	3 33	2 02	1 91
<i>The Half Year's Rain.</i>		23 31	10 78
<i>Depth of the whole Year's Rain.</i>		44 53	22 03
June.	4 90	2 32	5 91
<i>The Half Year's Rain.</i>		10 67	17 31
July.		1 11	3 50
August.	2 27	2 94	3 15
September.	7 21	1 46	3 02
October.	5 33	0 23	2 44
November.	0 13	0 86	0 62
December.		1 97	2 62
<i>The Half Year's Rain.</i>		19 84	8 57
<i>The whole Year's Rain.</i>		19 24	32 66



A Table of the Rain at Pisa in some of the latter Six Months of the Year 1708. in Tuscan Pounds and Ounces; and the same reduced to English Pounds Troy-Weight, and Centesimal parts. Observed by Dr. Michael Angelo Tilli.

June.		July		August.	
Tuscan Weight.				Tuscan Weight.	
l.	oz.			l.	oz.
English Weight.				English Weight.	
l.	dec.			l.	dec.
1					
2	4 1 3 75				
3	2 2 1 99				
4					
5	3 3 4 3 06	30			
6	2 8 2 45				
7					
8	3 3 2 98				
9					
10	0 9 0 69				
11					
12					
13					
14	2 1 2 68			10 1 9 25	
15	0 10 0 76			1 8 1 53	
16					
17				2 8 2 45	
18	11 1 10 17				
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					
31					
Total W. 28 53					13 23
Depth. 4 90					2 27

E

Septem.







Dr. *Scheuchzer's* Thermometer is about one Foot long; that I observed with all along (till it was broken this Year) about two Feet and a half; and that I now observe with, three Feet and a quarter; the bore of the Stalk is small, and the Ball is large, and consequently the Rang great, answering every the least Alteration of Heat and Cold.

I. I observe by comparing Dr. *Scheuchzer's* and my Thermometrical Observations. That notwithstanding the *Alpine Snows* have mighty Effects on the Weather in *Switzerland*, and other conterminous Places, yet there is much more Agreement between the Heats and Cold at *Zurich* and *Upminster*, than before comparing them, I imagined. (I speak with relation to last Year only, having no other Observations.) For in Winter, although I imagine we have more warm Days than they; and in Summer, that they have greater Heats than we; yet I observe that the Colds and Heats in both Places, begin and end nearly about the same time: Yea, that oftentimes any remarkable Weather (especially if of somewhat long continuance) affecteth one as well as the other Place. Thus for Instance, *June*, which was (some part of it at least, particularly the very Day after the Solstitial-day, *June 12.*) remarkably Cold in *England*, seems to have been not very different at *Zurich*; Dr. *Scheuchzer's* Thermometer divers times that Month, (though not on the very same days perhaps) descending as low, or rather lower than in the Month before, yea as low as many days in the Winter Months. But one thing I farther observed was, that all this Month their cold Weather constantly preceeded ours here about five or more Days. An Indication that (as shall be farther observed hereafter) the Weather in both Places was influenced by the same Causes, whether the *Alpine Hills* and Cold, or the Influx of the Moon and other heavenly Bodies, or any other Cause, I shall not enquire. And as in *June* there was a great Agreement in the unusual Cold, so in *August* there was not much less Agreement in Heat; the Heats in both Places being great, and beginning to abate about the same Time, only a little sooner here than there. In Winter also, although as I said, I imagine we have a great number of warmer Days than they, yet I find that a warm Winter Month there is so here; and a cold one there is a cold one here likewise. Thus in *February* and *March*, *October* and *November*, a great Agreement seems to have been between the Heats and Colds of both Places, some Days excepted. But *January* was at the beginning not so constantly Cold for the Season at *Upminster*, as it seems to have been at *Zurich*. And *December* last, which from the 8th Day to *Christmas-day*, was here moderate and open Weather, and after that more intensely Cold than even in the *Long Frost, Anno 1683.* by the fewer Thermometrical Observations which Dr. *Scheuchzer* made then, than in other Months, the greatest part I say, of that Month seems to have been intensely cold at *Zurich* as the later part thereof was with us remarkably in *England*.



2. I did not enter the Winds into Tables, because it may be sufficient to observe in general, That although many Days they agree in both Places, yet there are many more in which they differ. When they do agree, I find it is chiefly when they are strong, and of long continuance; and more I think when Northerly and Easterly, than in the other Points. Also I have observed, That a strong Wind in one place, hath been a weak one in the other.

3. As to the *Barometrical Observations*, mine own I selected which were made at Noon; and Dr. *Scheuchzer's* as near Noon as might be. For which reason I commonly took his Morning Observations, because made for the most part about 10 or 11 of Clock. Also I took those made with his Bent-Barometer; because they seemed to me (especially at the beginning of the Year) to be the most accurate. The Altitudes of his Mercury he measureth by the *Paris Foot*, which I have reduced to our *English Measure*, that they may be at an easy view compared with mine: For which reason I have also all along noted their Differences.

It is manifest from the Tables, That throughout the whole Year, the Mercury was lower at *Zurich* than at *Upminster*, by sometimes one, sometimes above two Inches *English*. The most remarkable Difference was at the latter end of *September* and beginning of *October*, when the Difference was of a good while above two Inches *English*. The reason of which, I guess, was because at *Zurich* I imagine the Air was more enclined to wet at that time, than at *Upminster*; as also because the Winds then were Northerly and Easterly with us; which, 'tis well known, do make our Barometers rise, even in wet Weather. But the main Difference between Dr. *Scheuchzer's* and my Barometers, I take to be about half an Inch *English*. From whence I conclude, That the Situation of *Zurich* is near a quarter of an *English Mile* higher than that of *Upminster* above the surface of the Sea; or else that that part of the *Terraqueous Globe*, lying nearer the Line, is (according to the received Opinion) higher, or farther distant from the Center than ours is, lying nearer the Pole. Farther, It may be observed from the annexed *Barometrical Tables*, That (as near the *Equinoctial* the Barometer is observed to stand nearly at a Stay, but the more Northerly the Latitude, the greater the rang of the Mercury, so) at *Zurich* the Difference (last Year) was not so great between the highest and lowest Stations of the ☿, as it was either at *Paris* or *Upminster*. For at *Zurich* the Difference was only one Inch *Paris Measure*; at *Paris* Dr. *Scheuchzer* saith it was one Inch two Lines and an half; but at *Upminster* it was 81. Inch, (and some Years 'tis more) which is greater than either of them.

The last thing which I shall take notice of relating to our *Barometrical Observations* is, That I observe, although there be some, and that a pretty deal of Agreement between the rising and falling of our Barometers, one being very often high or low, when the other is so; and



and one oftentimes rising or falling when the other doth so; and one rising much or little, or falling much or little when the other doth: I say although the matter is often thus, yet it is not so certainly so, as it is nearer Home\*. In the *Hist. de l'Acad. Roy. des Scien. Anno 1699.* \* v. n. 286 p. 1441. Abr. Monsieur Meraldi, by comparing his Observations at the Paris Observatory with mine at *Upminster*, takes Notice: "That there is a great Agreement between the Variation of the Heights of the Barometers in both Places; that he finds almost always that when one riseth or falleth, the other doth so too, although not always alike: That the Days in each Month whereon the Mercury hath been highest or lowest, it hath been the same at *Paris* as at *Upminster*, but ordinarily somewhat more than 3 or 4 Lines lower at *Paris* than *Upminster*". But the Agreement between the Variations of Dr. Scheuchzer's Barometers and mine, although I say often great, yet is not so constantly, nor so certainly great as nearer Home, viz. at *London*, *Lancashire*, *Paris*, and other Places, with which I have made the Comparison.

4. The first thing that in the Rain-Tables represents it self to our View is, That the Rains for the most part are more frequent at *Upminster* than either at *Zurich* or *Pisa*; I mean we have more Rainy Days than They.

Yet the Rains in both these Places are much greater in Quantity, in the whole Year, and in some Months, especially the Autumnal and Winter Months, than our Rains are at *Upminster*. *May*, *June* and *July* and a great part of *August* in 1707. seem to have been very dry, and I suppose searching Months at *Pisa*, as in some measure some of them were here: And in that time less Rain fell there than here. (But the following Autumnal Months made at *Pisa* sufficient amends; either by the great quantity that fell at a Time, I suppose in Thunder, and such like hasty large Showers; or else by the quantity and frequency both. What a prodigious quantity was that, for Instance, of above 32 Pounds on *August* 19? (If it all fell on that, and not some on the preceeding Days.) But we find very large Quantities at a time to have fallen on divers Days, where it is manifest the Rain was weighed every Day, viz. 10 Pound, 9 Pound, and other large Quantities for several Days together, in the cooler autumnal Months. But as the Weather groweth warmer, I imagine their Rains at *Pisa* are fewer, and fall in large Quantities. For which reason the quantity of Rain in the Spring-months of *March*, *April*, and *May* 1708. (oftentimes dripping Months in *England*) is nearly the same both at *Pisa* and *Upminster*. As to the Rains at *Zurich*, tho' they are less frequent than ours in *Essex*, yet they seem to be more frequent than theirs at *Pisa*: but the quantity at *Zurich* is greater than at *Upminster*, and less than at *Pisa*.



'Tis Dr. Scheuchzer's Opinion, "That more Rain falleth in Switzerland than in France, at Zurich than at Paris. To confirm which, he giveth us this Table of eight Years Rain at Paris, to which I shall add mine for Upminster.

The Rain at Paris in 8 Years.				At Upm.	
The Year.	Depth in Lines of Paris Measure.	Depth in Inches of Paris Measure.	Depth in English Inches & Centes.	Depth in English Inches and Centesimals	
		Inc. Lin.			
1699	224	$\frac{1}{4}$ 18 8	$\frac{1}{4}$ 19 93	15	01
1700	240	$\frac{1}{2}$ 20	21 37	19	03
1701	256	$\frac{1}{4}$ 21 4	$\frac{1}{4}$ 22 77	18	69
1702	196	$\frac{1}{4}$ 16 4	$\frac{1}{4}$ 17 45	20	38
1703	208	$\frac{1}{4}$ 17 4	$\frac{1}{4}$ 18 51	23	99
1704	238	$\frac{1}{2}$ 19 10	$\frac{1}{2}$ 21 20	15	80
1705	166	$\frac{3}{4}$ 13 10	$\frac{3}{4}$ 14 82	16	93
1706	183	$\frac{1}{2}$ 15 3	$\frac{1}{2}$ 16 31	24	29
Total Depth		142 10 $\frac{1}{4}$	152 36	154	22

It is manifest from this Table, That the Zurich Rain last Year (although it amounted not to the Quantity which fell at Pisa in a whole Year, yet) exceeded both the Paris and Upminster annual Rains of 8 Years before. 'Tis necessary that I take notice, That there is a greater difference between these last 8 Years Rain at Paris and Upminster, than I found in the 8 Years, in which I\* formerly compared the Rain of Towneley, Paris, Lisle, and Upminster together. For by that Comparison it appeared, that less Rain fell at Upminster than at either of the other three Places. But according to these later 8 Years in the Table, a small matter more falleth at Upminster than at Paris. For the mean Proportion for Paris (which according to former Years was above 20 Inches Paris Measure, or 22 Inches English) is according to these last 8 Years no more than 17 Inches, 9 Lines, Paris Measure, or 19 Inches English. And Upminster-Rain, which I formerly computed at, Year for Year, about 20 Inches and an half English, is for these 8 Years much the same, or a little more than that at Paris. The Proportions therefore which I shall lay down for the yearly Rain of all Places, whose Rain I have had Information of, are these; for Zurich (till farther Observations are made)  $32\frac{1}{2}$  Inches; for Pisa (till farther Observations also)  $43\frac{1}{4}$  Inches; for Paris 19 Inches; for Lisle, 4 Inches; for Towneley in Lancashire  $42\frac{1}{2}$  Inches;

\* n. 297. p.  
1879. v. Abr.  
Tract. VII.  
infra.



Inches; for *Upminster*  $19 \frac{1}{4}$  Inches; all the same, that is *English* Measure.

The last Observation I shall make upon the Rain Tables is, The great use of Cold to the making of Rain. That Exhalations and Vapours are the matter of Rain, is not to be doubted. When those Vapours are raised, they are constipated and condensed into Clouds and Rain, chiefly by the Cold of the Air to which they are elevated. And the greater the quantity of Vapours raised is, and withal the more intense the Cold of those airy Regions, the greater is the quantity of Rain. This is manifest from the annexed Tables compared with Doctor *Scheuchzer's* and my *Weather, &c. Observations*. Thus for instance, *January*, which as Dr. *Scheuchzer* frequently observed, was sometimes warm, sometimes cold; and appeareth farther to have been so by his *Thermometrical Column*, and which was the same with us in *South-Britain*; that Month, I say, had plenty of Rain at *Zurich*, *Upminster*, yea, and *Pisa* too. The same might be said of *February* for *Zurich*, and probably *Pisa* too. So also for *December* in 1707. at *Pisa* and *Upminster*; and *December* last at *Zurich* and *Upminster*. But with us *February* was for the most part a cold Month, and the Rain the less, by reason the Vapours either could not be raised in plenty enough, or not be carried high enough, or suspended long enough to be united, but soon were precipitated back again to the Earth. From the plenty of Exhalations and Cold of the airy Regions, I conceive it is, that at *Upminster*, about the Equinoxes, we have often more Rain than at other Seasons. But I cannot say this is certain and constant. Thus it was the Autumnal Equinox in 1707. not only at *Upminster*, but at *Pisa* too. So at *Zurich*, *Pisa* and *Upminster* about the Vernal in 1708. and at *Zurich* and *Upminster* the last Autumnal Equinox. And this very 28th of *March* 1709. whilst I am writing this, I have a pregnant Proof of what I am saying. For not only the unusual Cold of the Winter hath been succeeded by as unusual quantities of Rain all this Month; but at this very time the Weather is open, but withal cool. Particularly *March* 26. many Vapours arose, so as to fill the Air with a warm stinking Fog. The Night following, a smart Shower of Hail fell, a manifest Indication of the Cold of the middle, or top of the lower Region of the Air. And the Day after, viz. *March* 27. proved so wet a Day, that almost 5 Pound of Rain fell through my Tunnel, a large quantity for the Compass of 12 Inches Diameter in 14 or 15 Hours time. The Wind and Clouds were all the while calm and still, and frequently changing from Point to Point, near round the whole Compass; and the Rain that fell, fell thick, in small drops. Which makes me think, that the warm foggy Vapours, raised in great plenty the day or two before, as soon as they were mounted aloft, met with suddain extreme Cold of the middle Region, and were thereby hastily condensed, and the Air being at the same time very light (the Barometer being then very low) they speedily tumbled down in small and thick Drops of Rain.

And



And this I take to be the very Case of the vernal and autumnal Rains already mentioned, viz. In Spring, when the Earth and Waters are loosed from the brumal Constipations, the Vapours arise in great plenty. So also in Autumn, when the Heats that dissipated them in Summer, and also warmed the superior Regions, are abated, the Vapours raised then in great plenty are soon condensed by the Cold of the superior Regions, and so are forced down in more plentiful Rains than at other Seasons, when either the Vapours are fewer, or Cold of the superior Regions less. For an Illustration of what hath been said, let us again cast an Eye upon *June* last, a Month as unseasonably wet, as 'twas unusually Cold. The Cold thereof I have already taken notice of; and the wet Weather accompanying it was so unseasonable to us in *South-Britain*, that although we had great and welcome Crops of Hay after a great Scarcity the preceeding Year, yet we had scarcely any good Weather to make it in. So Dr. *Scheuchzer* saith it was with them in *Switzerland*, in his Remarks on that Month. *Fuit hic mensis, ut ex pluvia mensurata constat, præter modum humidus, & magno quidem Vegetabilibus Hominibusque damno. Multum computruit Fœnum; Gramina, quæ nondum fuere rejecta, ad nimium venere maturitatis gradum. Vites earumque Flosculi multa sustinuerunt damna a Pluvia continuo fere lapsu; deciderunt tenella Petala, Foliis rubigo inducta est, ut macra admodum sit Autumnus venturi spes, &c.*

I shall shut up these Remarks with one thing concerning the *Alps*; and that is, I cannot but think that those and all such like high Mountains, and the Snows they are covered with, are of great use to the neighbouring, yea more distant Countries, in generating their Rain, and performing other great Offices of Nature. From some Observations I have made in running over, and comparing Dr. *Scheuchzer's* and my own larger Tables, I have so frequently observed the Risings and Fallings of the Barometer, some of the most considerable Variations of the Wind, the most remarkable Alterations of Heat and Cold, and of Wet and Dry; I have I say, so often observed many of these to precede in one place what hath follow'd in another, that I am apt to think that even *England* may sometimes partake of the Effects of the *Alpine Mountains* upon the Air and Vapours. It is certain that their very cold Weather in *December* last, and the Relaxation thereof, preceded ours: Which makes me inclined to think it might probably be derived from them to us. All the former part of that Month, especially from about the 8th Day till the 24th, was here mild and open. But on *Christmas-day* it began to be colder, and the following Days to freeze harder and harder; insomuch that on *December 30.* my Thermometer was a great deal lower than ever I had seen it before. And two curious Persons in *London* told me, that the Spirits in their Thermometers fell several Degrees lower this last Winter, than they had done in the self-same Thermometers during all the long and remarkable Frost in the Year 1683. Whether at *Zurich* the Cold was more excessive, than it used to be



be in other Years, Dr. Scheuchzer doth not say; but he noteth the Air to have been excessively cold, and his Thermometrical Observations shew it to have been so sometime before, in and after *Christmas*. And Dr. Newton in a Letter he honoured me with lately from *Florence*, saith, "The Cold was there so great, that for twenty Years past they had not been sensible of greater; it wanting on *Twelfth-day* but half a Degree of the Extremity. Their *Twelfth-day* I reckon fell on *December 26*. O. S. and consequently their so eminently Freezing-day preceded ours about four Days".

And as their Cold, so the Relaxation thereof preceded ours a short time. For about the latter end of *December* the Weather appears to have been milder, at least less intensely Cold with them. And so was ours at the beginning of *January*, about as many Days after theirs, as their Cold preceded ours. Thus I have given one eminent Instance of what I found lesser Examples frequently, as I run over Dr. Scheuchzer's last Year's Observations. But whether there may be any further Reasons for any such Conclusions about the Influences of the Alpine Eminences and Colds upon far distant Places, future Observations will I hope determine. But as to the Influences near Home, Dr. Scheuchzer saith, *Alpes fecunda mater sunt, ut Fluminum & Nubium, ita quoque Nivis & Pluvia. Credibile omnino est, loca Mari, Alpibusque viciniora, plus etiam experiri Pluvia remotioribus aliis.*

From Dr. Tilly's Table of Rain at *Pisa* compared with the foregoing, it appears, that though in the Year before, *June* and other Summer-Months were dry, yet last *June* was a wet Month at *Pisa*, as well as *Zurich* and *Upminster*, and so likewise was it about the Autumnal Equinox. As to the Excess of the *Pisa-Rain* above that of other Places, Dr. Tilly attributeth it to the same Cause that I did that of *Lancashire*; namely, the Height of the Hills, and the blowing of the Winds for a long time from some one Quarter. His Observation is this; *Libenter admitto Pluviam nostram semper, vel ut plurimum, vestram superare, ea sane ratione ut-----animadvertisti; & precipue si aspera Corsica juga, autumnis tempore, nive cito cooperiantur: Tunc Australes venti diu vigent & Imbres. Aquilonares vero frequentius circa Florentinos colles, quam circa Pisanam urbem spirare plane constat. Est enim hac civitas a Borea circumdata montibus, & pari intervallo circa milliaria quinque distat a mari.* The same Account of the Situation of *Pisa*, and the great quantity of Rain falling there, I remember I had some time since from a very ingenious Member of this Society, Mr. Aston, who hath been there; who withal, added (if I mistake not) that *Pisa* was for that reason called, or might be called, *The Piss-Pot of Italy*.

VI. The first Column, having D at the top, contains the Day of the Month. That with H, the Hour of the Day, which beginning from one of the Clock in the Morning, I count round in one continued Series to 24, which is 12 a Clock at Night. The Column Ther. is that of the Thermoscope,

*The Weather at Oates in Essex for 1692. by Mr. Locke, n. 298. p. 1917.*



Thermoscope, which was a sealed one. The Column *Bar.* marks the height of the *Mercury* in the Baroscope. The first number is the Inches of its height, the second number marks the 20th parts of an Inch above that Inch marked by the first Number. The Column *Hyg.* is that which marks the moisture of the Air. The Instrument I used was the Beard of a wild Oat, of which each Turn was divided into sixteen Degrees.

The Column of the Wind mark'd the Point the Wind was in, but not always exactly, because the Weather-Cock visible out of my Window was stiff and turn'd not easily, nor was the House it stood on situate exactly *East* and *West*; so that it was not easy by the standing of the Weather-Cock to know exactly the point of the Wind: Wherefore I contented my self to set down barely one of the four cardinal Points, when the Wind was pretty near it; and when it was more remote, the two cardinal Points between which it was, putting the Letter of the cardinal Point first, to which it was nearest; as when the Wind was between the *South* and the *West*, if it were nearer the *West* than the *South*, I writ W. S. and so of the rest. I marked besides the force of the Wind, which I divided into four Degrees. 1. When it just moved the Leaves. 2. When it blew a pretty fresh Gale. 3. When it was a hard and whistling Wind. 4. When it blew a Storm. Though these Divisions were not made with Exactness as they might have been, had one had an Instrument on purpose, yet they may give some help to those who would make Observations from such Registers as these. (o) was when there was not Wind enough to move a Leaf as I could see.

As to the Weather. *Cloudy* signifies more of the Sky (visible out of the Windows of my Study, which were *East* and *South*) cover'd with Clouds, than not. *Fair* the Contrary. *Between* when it was uncertain whether more of the Sky was cover'd or clear. *Covered* when no part of the clear Sky appear'd. *Close*, when the Sky was cover'd with one uniform thick Cloud.

The Thermoscope mark'd 4, which I made use of till *Mar. 7. 1701.* was one of those sold by Mr. *Tompion*, wherein o mark'd Temperate, and the Figures from thence increasing both upwards and downwards, shew'd the increasing of Heat and Cold from Temperate. *Sept. 22. 1701.* I began to use a new sealed Thermoscope, adjusted to a Scale made by Mr. *John Patrick*, who places o at the top, supposing it to be the Heat under the Line, and so the Figures increase downwards, with the increase of Cold. Temperate being placed at 45. This Thermoscope is marked 5 in my Register.



DECEMBER, 1691.

D	H	Ther.	Bar.	Hyg.	Wind.	Weather.	December 1691.
		4					
9	16	1.	2	30. $\frac{4}{2}$	S.	1	Fog.
10	17	2.	1	4	S E	1	Fair.
11	10	3.	1	4	S E	1	Fog.
12	9	3.	6	3	E	1	Frost, Close.
13	9	3.	4	30. 0	E	1	Close.
14	9	3.	7	29. 17	E	2	Frost, Fair.
15	9	4.	2	30. 0	E	3	Frost, Fair.
16	9	4.	4	4	E	3	Frost, Fair.
17	9	4.	6	6	E	1	Frost, Fair.
18	9	4.		5	NE	1	Close.
19	9	3. 3		3	NE	1	Fog, Thaw.
	24		29. 19			1	Cloudy, a little Rain next Morning.
20	10	3. 4		18	N	1	Close.
21	9	3. 6		19	N	1	Fog, Frost.
22	9	4.		18	N	1	Close.
24	10	2. 6		14	S W	2	Cloudy,
25	21	2. 1		15			Fair.
26	21	1. 7		13	W	3	Close.
	24			12			Rain before next Morning.
27	18	1. 6		6			
28	16	2. 6		9	S W	2	Fair.
	22			8			Rain.
	24			7	S	2	Rain hard.
29	9	3.		4			Close, and sometime after Rain.
	19	2. 7		4			Snow beginning at 6.
30	8	3. 7		10	N W		Fair.
31	9	4. 7		12	N W	0	Fair, hard Frost.
	17	3. 3		10	S E	1	Cloudy, Thaw.



J A N U A R Y, 1692.

D	H	Ther.	Bar.	Hyg.	Wind	Weather.	January 1692.
1	9	3. <sup>4</sup>	7 29.	11	47	S E	1 Close. Snow at 10.
2	9	3.	7	14	43	W	1 Fair.
3	9	3.	5	8	41	S	2 Clouds.
4	8	3.	6	11	43	S	1 Cloudy.
5	9	3.	7	13	43	S	1 Cloudy.
6	8	4.	3	11	36	S	2 Close.
	16	4.		8	36	E	3 Close.
	20	4.	2	6	41		Snow.
7	10	4.	1	7	45	E	2 Close.
	24	3.	7	17			Close.
8	9	4.	1 30		45	N E	1 Close.
9	9	2.	6 29.	18	50	S	3 Close.
	20			15			Rain.
10	9	2.	7	18	44	S W	1 Fair.
	12			26			In the Shade.
11	9	2.	6 30.	4	48	W N	1 Close, with a little Fog.
	24	2.	5 30.	8	41		Very fair all the Afternoon, now close.
12	9	2.	7	9	44	N	1 Mifty.
13	9	3.	4	9	46	S	1 Close.
14	9	3.	7	7	48	E	1 Fog.
15	9	4.	4	6	31	E	1 Fog, Frost.
16	9	4.	5	2	45	N	1 Fair, hard Frost.
17	10	4.	1 29.	18	43	N E	2 Close, hard Frost.
18	8	4.	1	12	35	N W	2 Fair, Rain and Snow for an hour about 16.
19	9	3.	7	9	44	N W	2 Snow till 13
20	8	4.	5	5	43	NW	1 Fair. Some Clouds. Snow in the Afternoon.
21	9	5.	7	6		N	2 Fair. Snow in the Afternoon.
22	9	5.	6	9	18	N W	2 Very fair, hard Frost.
	10	6.	2				In a Northern Closet without Fire at any time.
	24	6. 5 $\frac{1}{2}$					In the same Closet, very hard Frost.



D	H	Ther.	Bar.	Hyg.	Wind	Weather.	January, 1692.
		4					
23	9	5.	7	11	31	N W	2 Fair, Snow a little at 14.
24	9			11	28	N W	1 Cloudy, hard Frost.
25	9	5.	6	10	31	N W	1 Fair, hard Frost.
26	9	6.	0	9	32	N W	1 Cloudy, hard Frost.
27	7	5.	3	7	33	N	1 Cloudy, hard Frost.
28	9	4.	6	4	33	N	1 Snow in the Night, and Snow still.
29	9	5.	6	2	32	W	1 Close, Snow all Afternoon.

N. B. I suspect that from the 23d to the 29th inclusively, the Hygroscope has been counted 16 Degrees, i. e. one whole Turn too high, it being all that while very hard Frost.

30	9	4.	4	2		N W	2 Snow.
31	9	5.	3	8		N W	1 Close.

FEBRUARY. 1692.

1	8	5.	0	10	19	W	Fog.	
2	9	5.	6	11	19	W	1 Fog.	
3	8	5.	7	11	20	W	1 Fog.	
4	9	5.	5	9		E	2 Close.	
5	9	5.	4	7	26	E	3 Close, Snow in the Evening.	
6	9	5.	1	29.	0	20	E	1 Snow.
7	9	4.	6	2		N	1 Close, Fog, little Thaw at 12.	
8	9	4.	6	29.	0	40	N E	2 Fog, Snow in the Night.
9	8	5.	3	29.	0		N E	2 Snow.
10	9	5.	5	1		N E	2 Close.	
11	8	6.		8		W	1 Fair.	
12	9	7.	0	11		N W	Close, Freezing excellively.	

13 9 4. 2 5 S W 1 Close Thaw. It may be observed between the Thermoscope to Day and Yesterday Morning, there is the difference of two whole Degrees and  $\frac{6}{8}$ , a greater rise than one shall ordinarily find. The Thermoscope was unmoved in a corner of a very large Room, out of all reach of the Fire, whereby it might be altered.

14				7			Close.
16	12			10			Close.



D	H	Ther.	Bar.	Hyg.	Wind	Weather.	February, 1692.
		4.					
17	19		9			Fog.	
18	12		5		W	Snow.	
26	2		11		W	2 Close.	
27	9	2.	3	29.	8	W 2 Fair.	Rain from 15 to 19.
28	9	3.	1	6		W 1	Close, Snow last Night.
29	9	3.	6	6		S W 2	Cloudy. Snow last Night.

## M A R C H. 1692.

1	8	2.	7	28.	17	S W 3	Fair.
2	8	3.	1	29.	5	S W 3	Fair.
3	7	2.	6		8	W S 2	Fair.
	16	1.	4		8	W S 1	Rain very gently till 20, hard till 23.
4	9	3.	1		14	N E 2	The Ground covered with Snow. Close.
5	9	3.	4		18	W 2	Cloudy.
6	9	2.	4		11	W 2	Rain till 16.
	16	2.	0		9	W 1	Rain.
	22	2.	2		10		Fair.
7	9	3.	5		10	W 2	A little dropping.
	12				9	W N 2	Snow for $\frac{1}{4}$ Hour.
8	9	3.	3		14	W 1	Fair.
9	8	3.	3		15	25	S W 2 Fair.
10	9		6		19	17	S 1 Fair.
	17	2.	2		18	19	W 2 A little Rain.
11	9		1		19	25	W N 1 Close.
12	9		5	30.	1	23	N W 1 Close.
	14	2.	0	30.	0	24	W N 2 Close. Small Rain at 15 till 16.
	16	1.	7	29.	19	40	W N 1 Very gentle Rain.
	23		7		16		N W 2 Hard Rain for 3 or 4 Hours past.
13	9	2.	3		13		W N Very gentle small Rain.
	12				11		N W 2 Fair.
14	9	2.	6		11	27	N W 2 Close.
	16		5		13	25	N E 3 Fair
15	8	4.	0		16	25	N E 2 Close. Frost last Night.
16	9	3.	4		14	25	N W 1 Close.
	13		0		13	20	N W 1 Fair. Rain in the Night.
17	9	3.	0		8	25	N E 1 Close.
	13				7		S E 1 Cloudy.



D | H | Ther. | Bar. | Hyg. | Wind. | Weather. *March, 1692.*

		4.				
18	2.	2	6		S E 2	Clofe.
19			5	29		Small Rain.
23			4	35		Clofe. Much Rain in the Night.
18	8 2.	3	1	41	W S 2	Clofe.
19	9		6	34	S W 2	Cloudy.
20	9	2	2	31	S 2	Cloudy. Rain last Night, Houses yet dropping.
21	8	3	3	29	o	Clofe.
14	1.	3	3	27	N E 2	A. very little Shower.
22	8 3.		6	27	N E 1	Clofe a little, very little Snow in the Afternoon, <i>Mercury</i> rising.
23	8 3.	5	10	26	1	Clouds.
17	2.	7	10	20	S W 1	Clofe.
24	8 3.	5	29 14	24	S W 1	Very fair, little Snow and Hail about 13, the <i>Mercury</i> falling a little.
25	8 2.	7	10	27	S W 2	Fair.
26	8 1.	6	2	35	3	Rain very little at Night.
12			5		S W 4	Clofe.
18	1.	0	7	29	S W 2	Clofe.
24			7	34	1	Hard Rain, the <i>Mercury</i> a little fallen.
27	8 1.	0	7	37	W S 2	Clofe.
17	0.	2	2	33	W 1	Small Rain.
28	7 0.	7	12	33	W 1	Clofe.
16	0.	5	12	30	W 1	Fair.
29	8 1.	6	10	32	W 1	Rain. Rain a great deal last Night.
13			8	2	N 1	Clofe, missing Rain all this Morning till now.
15			7		N 1	Clofe.
22	1.	6	5	31		Fair.
30	8 2.		1	32	W 2	Clofe, Rain last Night.
15			2		N W 3	Rain, as almost all this Morning.
19			3		N W 3	Rain gently, as the great part of this Afternoon.
24			6			Fair.
31	9 3.	1	6	29	N W 1	Fair.
24			3			Clofe, Rain in the following part of the Night.



A P R I L, 1692.

D	H	Ther.	Bar.	Hyg.	Wind	Weather.	April, 1692.
		4.					
1	9	2.	6	2	32	S	1 Small Rain.
	24			1			The greatest part of the foregoing day gentle Rain.
2	9	1.	7	28	16	39	S E 2 Close, Rain a great deal last Night, so as to make a Flood.
	16		1	17		S W	2 Fair.
	24			19			Close, Rain in the following part of the Night.
3	9	2.	2	29.	0	23	N 2 Close.
	14	1.	7	2	32	N W	3 Small Rain.
4	8	3.	4	10	30	N	2 Fair.
5	8	3.	2	19	26	N W	1 Cloudy.
	14	2.	1	19	26	N W	1 Rain, the Mercury a little risen, the Rain lasted about an Hour.
	14	2.	1	19	26	S E	1 Rain.
	17	2.	1	19	26	S E	1 Rain.
6	8	3.	2	30.	3	27	N E 1 Cloudy.
7	8	3.	0	4	25	N	1 Fair.
	3			2	25		Close.
8	8	2.	4	2	23	N E	1 Close.
	24	1.	7	1	22		Close.
9	8	2.	0	29.	19		N E 1 A little Fog.
10	9		3	30.	0	21	N E 2 Fair, $\frac{13}{16}$   $23\frac{16}{16}$ .
11	8		4	2	17	N E	1 Not a Cloud, $16\frac{5}{8}$ .
12	8		2	1	12	N E	1 Scarce a Cloud, $15\frac{9}{14}$ .
13	8	1.	4	34.	0	7	N E 1 Not a Cloud.
	13	0.	2	29.	19	3	E 1 Not a Cloud, but a thick Air called a red Wind.
14	8	1.	0	16	10	N E	1 High Clouds.
	23	0.	3	15	8		Clouds.
15	7	0	3	15	9	N E	1 Very Fair.
16	8	0		18	8	W	2 Very Fair.
17	9	0.	3	17	6	S W	2 Very Fair.
	23	0.	6	16	7		Small Rain for a little while.
18, 19	0.	1	15	18	S W	2	Cloudy.



*In the Closet on the North side of the House.*

D <sup>H</sup>	Ther.	Bar.	Hyg.	Wind.	Weather.	April 1692.
18	15 <sup>4</sup> 0.	3	14	16	S W 2	Clofe.
	23 0.	2	14	18		Rain.
19	9 1.	0	15	18		Fair.
	16 0.	5	15	16	SW 3	Clofe.
20	9 0.	---2	15	16	W 1	Fair.
	9 0		6	18	S W 2	Clofe, a little Rain this Morning.
21	23 0.	4	1	27		2 Rain, as it had been most part of the Day,
22	8 1.	1	29.	0	17	
30	24 2.	3	4	21	NE 3	Rain, and all the day before Rain.

*M A T. 1692.*

1 10 2. 2 8 29 NE 2 Cloudy,

*In the Chamber, on the South side of the House.*

2	8 2.	1	12	29	N W 2	Cloudy, Rain last night, the Mercury was at 23 last night as now.
	18	3	11	27		1 Fair, 2 or 3 Showers since 8.
3	9 2		14	29	NE 1	Fair.
4	11 1		14	26	N W 1	Fair.
5	8 2.	6	16	23	N W 2	Clofe.
6	8	6	16	24	N W 1	Fog.
7	8 0.	2	14	21	W 1	Fair.
	19		13			Rain.
8	9 0	3	17	16	NE 1	Cloudy.
9	8 0	1	19	13	NE 1	Fair.
10	7 2	2	19	12	NE 2	Fair
12	17 0		19	5	NE 2	Fair.
14	10 1.	0	19	12	NE 2	Fair.
15	9 0	2	19	12	NE 1	Rain a little.
	16 0	4	19	13	NE 1	A few Drops, the Mercury sunk a very little.
16	7 0		17	13	E 1	Fair.



D | H | Ther. Bar. | Hyg. | Wind. Weather. May, 1692.

17	8	0	4	29.	14	8	N E	1	Not a Cloud.
18	7	0	6	29.	12	5	S	1	Clouds, a little Shower about 10
19	9	0	5		12	6	W	2	Cloudy, i. e. more Clouds than clear Sky.
20	9		3		10	5	S E	1	Cloudy.

N. B. Cloudy signifies more of the Sky cover'd than clear. Fair signifies more open Sky than cover'd with Clouds.

21	9	0			9	6	S W	1	Cloudy.
	18	0			9	5	S W	1	Rain for about an Hour.
22	8	0			12	6	N E	1	Clofe, i. e. the Sky no where to be seen for Clouds, a shower about 17.
23	6	0	2		18	7	W	1	Fair, i. e. more Sky than Clouds.
	9		2		18	8	S W	1	Very Fair.
	15		0		18	7	W N	2	Hard Rain about $\frac{1}{4}$ of an Hour.
	17	1		1	18	7	S W	2	Hard Rain.
24	7	0	4		17	8	N E	1	
25	8		5		14	8	S E	1	
26	8	1		1	10	6	E N	1	
	18	3			10 $\frac{1}{2}$	8	N E	2	Clofe, a Thunder Shower at 19, the Mercury being risen to 11.
27	7		7		12	7	N E	2	Clofe.
28	7	0		1	14	7	N E	2	Cloudy.
	12	0		2	14	9	N E	2	Cloudy.
29	8	1		1	13	10	W	2	Cloudy.
	13	1		3	13	10	W	2	Rain.
30	6	0		2	15	8	W S	1	Clofe.
	11	0			13	8	S W	3	Rain till night.
	14	0		1	11	9	S W	3	Rain.
	21		3		3	14		3	Rain hard.
	24		3	29.		17		4	Clofe.
31	7	0		3	1	14	W	4	Cloudy.
	24				2		W	4	Cloudy.
	24		1		4	12		2	Fair.



J U N E, 1692.

D	H	Ther.	Bar.	Hyg.	Wind.	Weather.	June, 1692.	
1	7	0. $\frac{4}{4}$	6	12	W	3	Fair.	
2	7	0.	4	13	W	2	Cloudy.	
	10	0. $\frac{1}{1}$	4	13	W	4	A shower for about $\frac{1}{2}$ an hour, and then fair and calm again, at 11 Rain again, the <i>Mercury</i> a little raised. Several Showers in this Day.	
3	8	0. $\frac{1}{2}$	13	14	W	1	Clofe.	
	9	0.	14	14	W	1	Rain a little.	
4	6	0.	14	13	S	1	Fair.	
	23	0. $\frac{2}{2}$	7	13		1	Clofe.	
5	9	0. $\frac{5}{5}$	4 $\frac{1}{2}$	13	S W	3	Cloudy.	
	12	0. $\frac{6}{6}$	4	14	S W	2	Hard Rain $\frac{1}{4}$ hour, several such Showers this Afternoon.	
6	7	0. $\frac{5}{5}$	29. 5	14	S W	1	Cloudy.	
	10	0. $\frac{3}{3}$	5	14	S W	2	Hard Rain $\frac{1}{2}$ Hour.	
7	7	0. $\frac{3}{3}$	6	13	S E	2	Betwixt Cloudy and Fair.	
	11	0. $\frac{1}{1}$	6	13	S E	2	Hard Rain $\frac{1}{4}$ Hour, and a very great Shower 1 Hour, <i>Mercury</i> standing as it was.	
8	8	0. $\frac{4}{4}$	7	13	0		Fair.	
9	9	0. $\frac{1}{1}$	6 $\frac{1}{2}$	15	W S	1	Rain a good part of last night, and all this morning.	
	24	0. $\frac{6}{6}$	11	18		2	Rain all the Afternoon till 20 or 21, the <i>Mercury</i> all the while rising, now clofe.	
10	9	0. $\frac{4}{4}$	12	18		0	Clofe, Rain the past Morning.	
11	9	0.	13	19	S W	2	Cloudy.	
	11	0. $\frac{3}{3}$	14	19	S W	2	Rain $\frac{1}{2}$ Hour.	
12	9	0. $\frac{1}{1}$	17	17	S W	2	Very Cloudy.	
13	8	0.	17	19	W	1	Cloudy.	
14	8	1.	1	16	W	1	Cloudy.	
15	7	1.	0	15	18	N	1	Very Fair.

In my absence, the Thermoscope being observed, it was found from the 15th of June to the 11th of August, never to get so high as 3, and was very often below Temperate, so cold was this Summer.



## AUGUST, 1692.

D	H	Ther.	Bar.	Hyg.	Wind	Weather.	August, 1692.
		4.					
13	19	2.	6	29.	10		Cloudy, Rain about 21.
14	9	1.	5	29.	10	S W 2	Cloudy.
	11	1.	6	29.	10	17 S W 2	Rain.
	23	1.	0		12	17	Fair.
15	9	1.	2		8	25 E 2	Cloudy, Rain last night.
	12	1.	5		7	26 S E 2	Rain.
16	8	0	5		12	25 W 2	Fair.
17	S	0	2		15	21 S E 1	Fair.
18	7	1.	1		14	22 S W 1	Cloudy.
	24	2.	1		13	22	Small misty Rain.
19	9	1.	4		15	22 W 2	Clofe.
20	8	1.	1		18	20 S W 1	Very Cloudy.
21	8	1.	0		16	19 S 1	Fair.
	10	1.	3		16	19 W 1	Very small Rain.
	12	1.	5		16		W 1 Very Cloudy.
22	8	1.	6		18	18 N W 2	Fair.
23	9	0	5	30.	0	16 S W 1	Not a Cloud.
24	8	0	3	30.	0	15	0 Not a Cloud.
25	8	1.	1	29.	19	15 S W 1	Not a Cloud.
26	8	1.	2		16		S E 1 Not a Cloud, Mercury gently sinking ever since Yesterday Morning.
	17	3.	5		16		1 Fair.
27	7	1.	5		14	12	Thick Fog.
28	8	1.	1	29.	16	12 N W 2	Very Fair.
29	9	0	7		16	10 N W 1	Very Cloudy.
						rac. S E	
	17	1.	3		15	12	0 Clofe, some small drops.
30	8	0	5		13	12 N W 2	Clofe.
	20	1.	0		12	13 N E 1	A little Rain.
31	8	0	2		13	12 N W 1	Very Fair.



S E P T E M B E R. 1692.

D	H	Ther.	Bar.	Hyg.	Wind.	Weather.
		4.				
1	9	I. 0	11	12	S W 3	Cloudy.
	12	I. 3	11	13	S W 3	A little Rain.
	14	I. 4	11	13	S W 2	Hard Rain for 1 Hour, and soft till 17.
2	3	0 2	14	11	W 2	Fair.
3	9	0 6	14	10	W 2	Cloudy.
4	8	2. 0	15	8		
5	8	I. 6	16			Very Fair.

O C T O B E R. 1692.

18	22	0 6	29.	11	W 2	
19	9	0 5		4	S 3	Rain.
20	9	I. 2		5	S W 2	Very Fair.
	18	0 3		2	16 S W 4	Rain.
21	9	I. 4		10	17 W N 2	Not a Cloud.
	24	0 5		15	16	Rain.
22		0 3		16	37 W S 3	Cloudy.
	16	0 3		17	33 W S 2	Cloudy.
23	9	0 3		17	33 S W 1	Cloudy.
	15	0 3		16	24 S W 1	Fair.
24	9	0 5		15	27 S W 2	Fair.
	14	0 1		16	30 S W 1	Small Mift.
25	8	0 5	30	30	W 2	Clofe.
	15	0 3	29.	19	29 W 2	Scarce a Cloud.
26	9	0 5		16	28 W 1	Cloudy.
27	9	I. 1		13	27 W 1	Clofe.
	23	0 7		13	27	1 Clofe, a little missing Rain good part of the Afternoon.
28	9	I. 0		15	28 N W 1	Cloudy.
29	9	I. 1		17	28 E 1	Clofe, a little Fog.
		0 7		18	29 E 1	Clofe, a little gentle Rain about 15.
30	9	2. 1	30.	1	26 E 2	Cloudy.
31	8	3. 0	29.	19	18 N E 1	Fair.



D	H	Ther.	Bar.	Hyg.	Wind	Weather.	October, 1692.
		4					
11	2.	6	18	19	N E	1	Hard Snow, which lasted till past Mid- night.

## NOVEMBER, 1692.

1	9	3.	5	29.	9	19	N E	1	Fair, scarce a Cloud.
2	11	4.	0		7	20	S W	1	Rime and Frost.
	15	3.	6		7	20	S W	1	Snow, which began at 13, and lasted to 20.
3	9	3.	5		7	23	W	1	Clofe.
	12	3.	0		5	25	W S	1	Rain, which began at 11, and lasted till 17.
	24	2.	0		1	39		3	Clofe, Rain before One, and so the great- est part of the Night.
4	9	1.	5		3	40	S	2	Clofe.
5	9	1.	4		13	36	N E	1	Clofe, Rain last night.
6	9	2.	0		15	33	N E	1	Clofe.
7	8	2.	2		16	32	N E	0	Clofe.
8	9	2.	1		14	32	E N	1	Clofe.
	16	2.	0		14	33	N E	1	Rain, which began at 14, and continued till 24.
9	9	2.	2		13	33	N	2	Small Rain for a very little while.
10	9	2.	4		17	32	N W	1	Not a Cloud.
11	9	2.	4		17	30	W	1	A little Fog.
	16	1.	6		14	32			Hard Rain.
12	9	1.	5		10	33	W	1	Rain.
13	9	3.	1		4	30	W	0	Fair, Frost.
14	9	4.	2		12	28	N W	2	Very fair, hard Frost.
15	9	4.	6		16	26	W	0	Very fair, hard Frost.
16	10	4.	1		8	31	S	3	Clofe, Snow last night from eleven, the greatest part of this Day.
17	9	3.	7		8	34	S	1	Very Cloudy.
	13	3.	0		6	35	S W	2	Rain.
18	8	4.	0		10	37		0	Fog, in the Closet on the North side of the House.



D/H/Ther. | Bar. | Hyg. | Wind. | Weather. November, 1692.

26	22	4	2	18		3	Clofe, in the Clofet on the North fide of the Honfe.
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27	10	4	4	16	34	E	2	Cloudy.
----	----	---	---	----	----	---	---	---------

28	9	4	6	18	32	E	3	Fair, Frost.
----	---	---	---	----	----	---	---	--------------

29	9	4	6	16	31	E	3	Clofe, Frost.
----	---	---	---	----	----	---	---	---------------

30	9	4	5	18	33	E	3	Cloudy, Frost.
----	---	---	---	----	----	---	---	----------------

## D E C E M B E R.

1	9	4	5	30	0	33	E	2	Rain mixed with Hail, the Rain as it fell Froze, and continued mifling till 14 or 15.
---	---	---	---	----	---	----	---	---	---

2	9	4	1	30	0	38	S E	2	Rain, which began laft night, and lafted all this Day.
---	---	---	---	----	---	----	-----	---	--

3	17	3	4	29	17	39			Fog.
---	----	---	---	----	----	----	--	--	------

3	9	3	6	19	45	S W	0	Thick Fog, Frost.
---	---	---	---	----	----	-----	---	-------------------

4	9	2	6	5	48	S	2	Rain all the Morning.
---	---	---	---	---	----	---	---	-----------------------

5	12	2	3	3	49	S W	2	Cloudy.
---	----	---	---	---	----	-----	---	---------

5	10	2	4	5	54	S W	2	Cloudy.
---	----	---	---	---	----	-----	---	---------

6	11		2	7	53	W	2	Cloudy, fome Rain this Morning.
---	----	--	---	---	----	---	---	---------------------------------

7	9		2	2	54	W	2	Clofe.
---	---	--	---	---	----	---	---	--------

8	9	1	4	28	18	56	S W	4	Rain and Stormy, Wind all this Day.
---	---	---	---	----	----	----	-----	---	-------------------------------------

	23		0	15	58	S W	4	Hard Rain.
--	----	--	---	----	----	-----	---	------------

9	9		4	16	55	S W	3	Cloudy.
---	---	--	---	----	----	-----	---	---------

	11	7	5	15	53		3	Hard Rain.
--	----	---	---	----	----	--	---	------------

	24	2	1	15	52		3	Fair.
--	----	---	---	----	----	--	---	-------

10	10	2	4	29	1	52	S W		Very Cloudy.
----	----	---	---	----	---	----	-----	--	--------------

	24	3	1	11	52		0	Very Fair.
--	----	---	---	----	----	--	---	------------

11	9	3	4	12	53	W	0	Very Fair.
----	---	---	---	----	----	---	---	------------

	18		2	13	52	E	1	Very Fair.
--	----	--	---	----	----	---	---	------------

12	10	3	0	10	54	S	2	Clofe.
----	----	---	---	----	----	---	---	--------

	15	2	6	6	53	S E	3	Rain a little and fhort.
--	----	---	---	---	----	-----	---	--------------------------

13	9		3	4	54	S E		Clofe.
----	---	--	---	---	----	-----	--	--------

14	9	1	6	5	56	S	2	Rain all day.
----	---	---	---	---	----	---	---	---------------

	18	1	4	3	57		2	Rain yet.
--	----	---	---	---	----	--	---	-----------

15	9	2	0	11	56	W	1	Very Fair.
----	---	---	---	----	----	---	---	------------

	15		1	13	56	W	1	Thick Fog.
--	----	--	---	----	----	---	---	------------

16	9		4	11	54	S	2	Clofe.
----	---	--	---	----	----	---	---	--------

	15	2	0	11	57	S W	2	Rain from 12.
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17	9	1	6	14	56	S W	1	Cloudy.
----	---	---	---	----	----	-----	---	---------



*In my Chamber on the South side of the House.*

D	H	Ther.	Bar.	Hyg.	Wind.	Weather.	December 1692.
		4.					
	11		1.	15	54	W N 1	Fair.
	17		4	17	49	W N 1	Fair.
18	10	2.	7	30.3	43	E 0	Very Fair, hoar Frost.
19	9	3.	2	0	43	S 0	Mist. A Mist is when the drops manifestly fall.
20	8	2.	6	29.17	45	N E 0	Mist, as it was all day yesterday.
21	9		4	12	46	S W 2	Close.
	19		1	4	48	S W 3	Rain.
22	9		1	6	48	S 1	Not a Cloud.
	24		5	0	42		3 Rain.
23	9		3	28.10	51	W 4	Rain, which had been all night.
24	10	3	2	19	45	W 1	Close.
25	11	3.	3	29.12	40	W 1	Fair, Frost.
26	9	2.	0	3	57	S W 3	Rain all last night.
27	9		6	3	51	S 3	Close.
	11		2	0	51	S W 4	Close.
	12		1	28.19	51	S W 4	Rain all day.
28	11	3.	2	18	48	S W 2	Rain.
29	9		6	29.6	48	S 1	Fair Frost.
	24		2	28.19	47	S 4	Rain.
30	9	2.	3	11	57	W 4	Rain very hard all last night till now.
	24		3	17	48		4 Fair.
31	9		6	15	46	W 4	Not a Cloud.
	20		5	29.8	39		2 Rain.
	24		4	10	40		1 Cloudy.



VIII. The first Table shews how many Pounds, and Centesimals of a Pound Troy of Rain, fell at Townley in Lancashire, and at Upminster in Essex in each Month of the Years 1699, &c. with the Quantity and Depth every Year.

Observations on  
the Weather,  
for some Years  
past, by  
Mr. Deham,  
v. 285. p. 144.

The Second Table shews the Height of the  $\varphi$  at Townley and Upminster, on the first Day of every Month in the Year 1702. three times a Day, viz. about 7 in the Morning, and at 9 at Night; and about 3 Afternoon at Townley, with the Difference of the  $\varphi$ 's Variation, and its Difference between both Places.

The Third Table shews the lowest Stations of the  $\varphi$  in the Year 1702. at Townley and Upminster; with the Difference of the  $\varphi$  at both Places.

	1699.				1700				1701				1702			
	Townl.		Upmr.		Townl.		Upmr.		Townl.		Upmr.		Townl.		Upmr.	
January	17	91	8	91	20	84	3	91	22	41	14	96	21	10	9	81
Febru.	32	70	60	5	19	12	7	64	16	78	8	78	21	27	7	30
March	17	92	5	63	7	58	1	55	7	10	3	91	2	48	2	37
April	10	47	3	44	18	65	7	60	6	11	1	43	5	34	10	90
May	4	00	2	67	17	92	6	91	19	67	9	11	8	81	6	49
June	10	37		40	13	15	7	60	11	34	5	79	23	00	13	46
July	16	51	6	36	15	26	4	24	17	58	9	49	25	31	4	39
August	19	77	8	57	12	05	8	14	23	66	6	57	20	12	5	88
Septem.	16	53	8	06	23	52	14	85	21	30	5	63	23	1	8	05
October	18	90	13	49	26	44	17	15	24	59	10	21	28	57	7	92
Novemb.	14	65	1	91	13	69	5	24	25	60	8	22	37	11	14	05
Decemb	16	78	5	77	26	88	10	30	10	19	9	35	41	63	10	27
Total	196	51	75	55	215	30	95	13	206	33	93	45	257	75	101	89
Depth	39	302	15	110	43	060	19	026	41	266	18	690	51	55	20	378



First D. of Mo.	♀ Heigh at Tow.	♀ Heig. at Up.	D. dif- at Tow	D. dif. at Tow.	♀ low.at Town.	First D. of Mo.	♀ Heigh at Tow.	♀ Heig. at Upr.	D. dif. at Tow.	D. dif. at Up.	♀ low.at Town.
Jan.	29 06 28 90 58	29 28 21 10		16 07 32 11	22 31 52	July	84 90 92	98 30 01 11		06 03 02 01	14 11 19
Feb.	29 58 40 30	96 91 80		18 05 10 11	38 51 50	Aug.	62 49 47	29 80 74 67		13 06 02 07	18 25 20
Mar.	36 36 40	68 66 58		00 02 04 08	32 30 18	Sept.	92 95 95	30 09 12 11		03 03 00 01	17 17 16
April.	70 68 69	79 73 79		02 06 01 06	09 05 10	Octo.	56 54 46	29 74 76 75		02 01	18 21 25
May	20 09 56	51 49 44		02 05 11 05	31 35 22	Nov.	50 58 35	71 75 76		04 01 08 01	25 25 18
June	61 82 05	82 05 04		04 21	21	Dec.	10 09 25	34 09 25		16 25 25 01	15 01

D. of Mo.	♀ at Town	♀ at Up.	Differ.
Feb. 3	29 15 28 50 27 50	29 50 16 20 43	35 66 93
4	39	05 05 62	66
Dec. 23	77 71 90	18 12 10	31 41 35
		25	

High. Stations of ♀ An. 1702.  
Upm. Town.

Ja. 30	30 25 25 19	29 95 95 83	30 30 36
Mar. 12	33 35 32	30 02 05 07	31 30 25
Oct. 21	07 18 22	29 94 99 30 00	13 19 22

More settled Stat. An. 1702.  
Town. Upmr.

April 7	30 04 00 02	30 13 15 16	09 15 14
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D of Mo.	♀ at Tow.	♀ at U.	Diff r.
Apr. 28	30 03 01 29 99	30 16 15 15	13 16 17
29	98 93 86	15 13 06	17 20 20
May 13	78 72 74	29 89 87 87	11 15 13
June 10	30 40 44	68 71 70	38 31 26
11	50 51 59	70 72 70	20 21 11
Aug. 30	45 57 59	86 86 88	41 29 29
Sept. 27	73 72 73	91 91 91	18 19 18
28	74 78 73	91 95 93	17 17 20



As to the most remarkable Weather, especially Rain of last Year, and the Effects thereof: Mr. *Towneley* tells me, that it is a general Complaint in the North of *England*, that there were but small Crops of Hay, which Calamity befel the Southern parts also; the Cause whereof may be perceiv'd by the foregoing first Table of Monthly Rain; in which you may perceive the growing Months of *March* and *April* to have been dry Months in *Lancashire*, and *May* no wet Month, considering the Quantities of the other Months, and of other Years. Here at *Upminster*, *April* was unfortunately a wet Month, till the 23d, or else no doubt, we should have suffered more than we did in the want of Hay; for the growing Month of *March* was a dry Month, by the Table; and *May* (which by the same Table seemeth to have had near a due quantity of Rain) was a very dry Month by the Tables sent to Dr. *Sloane*; for it appears by them, that very little Rain fell from *April* 23, till *May* 29, and then fell in great Showers, the greatest quantity of that Months Rain. Mr. *Towneley* doth not tell me Particulars, but I guess it to be after this manner with them in the North of *England*; for besides, that *March* and *April* were dry Months with them, and *May* somewhat more wet, yet probably the wet of *May* did not fall early in *May*; for it appears by Table the third, that the Mercury was high, and in somewhat a fixed Station on *May* 13. As to the other Months, there is little remarkable, besides the vast Disproportions of Rain between *Lancashire* and *Essex*, which I should scarce take notice of, if it was not what happeneth almost every Year, as will appear by the first Table. The Cause of this I cannot judge of, unless it be that *Lancashire* is a more Hilly Country than *Essex*, which sort of Lands, as they more need wet than Vales and low plain Countries do, so have greater Shares of it than these have: besides, something may perhaps be attributed to the Western Situation of *Lancashire* near the Sea; from which Quarter the Winds in *England* blow more than from the Eastward.

At the Foot of the Table of Rain, besides the quantity which fell in each Year, I have added the depth thereof in Inches; or what depth it would have been of, if the Earth had not imbib'd it, but it had stagnated on the surface thereof; I have added two Tables more, of the Stations of the Mercury in the Barometer at *Towneley* in *Lancashire*, and at *Upminster* in *Essex*, with the Differences thereof; and this observed at three times of the Day, viz. in the Morning, and about three in the Afternoon at *Towneley*, but at Noon at *Upminster*, and at nine a Clock at Night. One Table to the first Day of every Month; the other the most remarkably low, high, and more settled Stations of the Mercury the last Year 1702. By these Barometrical Tables, it may be seen whether at all, or how far consentaneous to Truth, that Opinion is of some both in *England* and Abroad, viz. That the Mercury ascendeth and descendeth in all places at the same time, and in the same proportion. It is manifest, that the Mercury doth commonly rise and fall in one far distant



place, when it doth so in another, but not alike : Also when any considerable Variation is in one place, it is so in another; when remarkably high, remarkably high; when low, low; when a great ascent or descent, generally the same elsewhere; but only the Differences of all these are not in equal proportion in all Places; all which seemeth reasonable to be expected, by reason of the Difference of Weather in different places, especially as to wet and dry.

There is one thing in the third Table, which I think deserveth especial Remark, because I believe it to be the most considerable Alteration of the *Mercury*, that hath ever happened since the Invention of the *Baroscope*, and that was the descent on *February* 3d and 4th last : Concerning which, Mr. *Towneley* in a former Letter gives me this Account, " That on *February* 3d the *Mercury* was at three in the Morning at 29. 15, at 3 h. 28. 50. and 10 at Night at 27. 5. The next Day it fell " yet lower, and about 12 was at the lowest, viz. 27. 39. but for an hour " before and as much after, it varied only so much as to make it sensible " that it was fallen and began to rise again; the lowest he had ever seen " it before was on *November* 18. 1674. when it fell to 27. 63. That " Mr. *Flamsteed* at the Observatory observ'd as remarkable a descent of " his *Mercury*; and that it happened about the same time of the Day, " viz. 2 of the Clock in the Afternoon at both Places. And lastly, he tells me, " That the descent in *February* last was the greatest that has " been since the filling his Tube, which was in *March* 1665. The particulars which I observed here at *Upminster* about that descent were, That on *February* 12, the *Mercury* was high, viz. 29. 80. the next Morning 29. 50. at Noon 29. 16. at Night 28. 43. the next Morning, (viz. *Feb.* 4.) at 7 of the Clock it was fallen to 28. 5. and was globose, as if it had risen or was inclined to rise; but it continued in the same Station till after Noon, and then began to rise about 2 of the Clock, and rose hastily. The Weather accompanying was fair on *Feb.* 3. in the Morning, Hazy at Noon, and Rain at Night, and a violent Tempest in the Night, and all the next Morning, of *Feb.* 4.

VIII. A Prospect of the Weather, Winds, and Height of the Mercury in the Barometer, on the first day of the Month; and of the whole Rain in every Month in the Year 1703. and the beginning of 1704.

Mon.	Weather at <i>Towneley.</i>	Weather at <i>Upminster.</i>	Winds at <i>Towneley.</i>	Winds at <i>Upminster.</i>	Baro. at <i>Tow.</i>	Baro. at <i>Upm.</i>	Rain at <i>Towneley.</i>	Rain at <i>Upminst.</i>
<i>Jan.</i>	Overcast.	Overcast.	S E 5	S E I	29 04 28 91 80	29 39 35 15 22	17	8 89
<i>Feb.</i>	Overcast.	Frost and Fair.	S S E 3	E I Clouds S	29 29 37 47 64	62 68 82	15 88	6 41
<i>Mar.</i>	Chequer'd.	Fair.	W S W N E	N W I	67	83	20 02	4 75 Snow



Mon.	Weather at Torneley.	Weather at Upminster.	Winds at Torneley.	Winds at Upminster.	Bar. at Town.	Baro. at Upminst.	Rain at Torneley.	Rain at Upminster.
		Snow.			29 73	29 92		
	Chequer'd	Fair.		W S W 1	59	93		
Apr.	and	Cloudy.	W	W 4	59	91	17	63 12 49
	Cloudy.	Fair.			55	91		
			N N E	N b W 3	49	66		
		Cloudy.		N W b N 3	00	70	17	64 20 77
May.	Cloudy.	Thunder, with Hail and Rain			60	75		
			S	S 0	38	61		
		Cloudy.		S 1	49	75	24	06 14 55
Jun.	Cloudy.	Clear.			63	88		
			S S E. S E	E 1	84	99		
July.	Cloudy.	Fair.	E 1	N b E 2	80	96	3	65 14 90
					77	90		
		Thunder	S E 1	N 2	57	72		
Aug.	Cloudy.	and Rain.		4 N by W 2	55	72	14	21 3 36
		Fairer.		4 Clouds S E	58	69		
			E	N W 1	80	30		
Sept.	Clear	Cloudy.		W N W 1	00	40	32	40 14
	Chequer'd.	Fairer.			18	40		
			N	N N W 4	28 76	87		
Oct.	Chequer'd.	Fair.			83		7	04 9 55
					86	30 08		
			E	N b E 1	29 56	29 72		
Nov.	Overcast.	Cloudy.			51		28	56 7 27
			W		52	69		
					36			
Dec.	Overcast.	Overcast.			45		10	24 2 14
	Cloudy.	Rain.			48	81		
			S S E	E 0	80	30 07	31	39 4 06
Jan.	Overcast.	Overcast.	S E 2	S E b E 1	82	10		
					85	10		
			W	N W b N 1	90	23	5	93 2 19
Feb.	Overcast.	Misting.			02	26		
		Cloudy.			02	26		
			S	S E b E 0	29 11	29 58	20	78 16 04
Mar.	Overcast.	Overcast.		S E 1		45		
		Fairer.				40		
	Cloudy	Rain with	W 4	S b W 4	28 72	17		
Apr.	and	Hail.	NW 7	Clouds	94	18		
	Chequer'd.	Fair.		SW by W	07	38		



Remarks on the  
above Tables,  
by Mr. Derham  
n. 297. p. 1887.

From hence it appears, 1. That (as I have before observed) every Year much more Rain falls at *Towneley* than *Upminster*. I have an Extract of the Rain at *Paris* and *Lisle*, as far as the *French* have publish'd their Observations. And I find there is about twice as much Rain falls at *Towneley*, as doth either at *Upminster*, *Paris*, or *Lisle*. Mr. *Towneley* hath formerly observed in one of the Transactions, that as much more Rain falleth at *Towneley* as *Paris*. And Mr. *de la Hire* observes, That more Rain falleth at *Lisle* than *Paris*. But *Towneley* doth far exceed, as hath been said, and will appear by Particulars. At *Lisle*, one Year with another, the Depth of the Rains amount to 22 Inches 3 Lines, *Paris* Measure, or 23 in 3 l. which make about  $23\frac{1}{2}$  Inches *English*, or  $24\frac{1}{2}$ . At *Paris*, one Year with another, they amount to 20 Inches  $3\frac{1}{2}$  Lines *Paris* Measure, which is near 23 Inches *English*. But at *Towneley*, one Year with another, according to Mr. *Towneley's* Computation formerly, the Rains amount to above 41 Inches depth. And by taking eight other Years, in which the Rain was observed both at *Towneley* and *Upminster* (*viz.* from 1696. to 1704.) I find that all the 8 Years Rain at *Towneley* amounteth to above 1700 l. Troy, at *Upminster* 823 l. only: which said Sums being divided by 8, give 212 l.  $\frac{1}{2}$ , one Year with another, at *Towneley*, and near 103 l. at *Upminster*. Each of which Sums being doubled, and making a Decimal Fraction of the last Figure, doth nearly give the number of Inches, which all the Rain would have risen to, if the Earth had not swallowed it up, *viz.*  $42\frac{1}{2}$  Inches at *Towneley*, and about  $20\frac{1}{2}$  Inches at *Upminster*. Wherefore the Rain at *Upminster* is less than at *Paris*, at *Paris* than at *Lisle*, and at every one of the Places less than at *Towneley* by much. The reason of which vast surmount at *Towneley*, is doubtless from the height of the Hills thereabouts, which retard or stop the Westerly Clouds: From which Point the Winds blow more than any other here in *England*.

2. Notwithstanding the great Disproportion of Rain between one place and another, yet there is a great Agreement between our Barometers; one rising or falling when the other doth; and that much, or little, as the other doth, although not always exactly in the same Proportion. And this is what I find Monsieur *Maraldi* hath observed, by comparing his Observations at *Paris* with mine at *Upminster*, in the Years 1697 and 1698. Only at *Paris* the *Mercury* is commonly 3 or 4 Lines lower than at *Upminster*. And so it appears to be at *Towneley*, from this and some other Tables, *viz.* 3 or 4 tenths of an Inch lower at *Towneley* than at *Upminster*. Which is an Argument that *Towneley* and *Paris* are situated higher above the surface of the Sea than *Upminster* (which is nearly in the same Level with *London*) is.

3. Another thing shown by the foregoing Table is, That there is some Agreement between the Winds at *Towneley* and *Upminster*. Which although not always exactly in the same Point, yet do often tend the same way; blowing within a Point or two perhaps of the same Course; especially when the Wind is somewhat strong. Or if the Winds have differ'd



differ'd, yet the Current of the Clouds hath commonly shew'd the Motion of the upper Air to agree thereto.

This happens often, but not always, and Monsiuer *Moraldi* has observ'd it at *Paris* in the aforesaid Years. *Vid. Hist. Acad. Sc. Anno 1699.*

## JANUARIUS.

7 . . . 12 . . . 9

	Cœlum.	Ventus.	Nubes.	Barom.	Th.	Pluvia.	IX.
	Gelu.	N b W o		30	14	79	Weather &c.
5	Apricum.	I	NE		17	90	at Upminster
	Nubilum.				16	87	in 1705. by
							Mr. Derham,
							n. 309 p. 2318.
10	Gelu cum	W o			21	82	
	Aere crasso.	E b S o			22	93	
					25	87	
15	Gelu sævum	W b N I			00	74	
	& nubilum.	S W o		29	97	85	
	Regelat.				93	95	
20	Gelu & Dies	E I		30	03	73	
	apricus.	E b S I			06	96	
					13	82	
25	Nebula.	E b S I		29	79	92	0 36
	Clarius.	E S E I			80	103	
	Nubilum.				81	92	
30	Nubilum.	N I	N b E	30	03	87	1.
	Ningit.	N b E I			02	97	I 11
	Nubilum.			29	99	90	

## FEBRUARIUS.

7 . . . 12 . . . 9

	Cœlum.	Ventus.	Nubes.	Barom.	Th.	Pluvia.
5	Pluvia.	S 2 S E b S 2		28	89	98
					77	102
					78	93
10	Apricum.	S S E I	S W b S	29	85	97
	Nebulosum.	S 5			81	115
	Pluvia.				66	107
15	Gelu. Apri-	N b W o		30	39	84
	citascum te-					
	nui nebula.				31	88
20	Nebulosum.	E b N 2			03	92
	Nubilofum.			29	97	100
					86	95
25	Gelosum.	S b E I	S S W		28	81
	Apricum.	S 2			27	115
	Pluviosum.				19	95
Sum. Pluvia						5 53



M A R T I U S						
	Cœlum.	Ventus.	Nubes.	Barom.	Th.	Pluvia.
5	Nebulum.	N N E 3	N E	29 61	94	
	Serenum.			65	90	
	Gelu.	S o	W b N	41	86	
10	Apricum.	E N E 1		40	112	
	Nubilum.			40	90	
		E 1	S	24	94	
15	Pluvia.			17	105	
	Caliginosu.	N b E 2		65	88	
20	cum Imbri-					
	bus nivosis.					
	Clarius, cu.	N b W 2		21	83	
25	guttulis ni-			33	104	
	vosis.			48	81	
	Turbidum	S b W 3		35	116	
30	& pluvio-	S W 8		30	127	1.
	sum.			22	108	5 55

A P R I L I S.						
	Cœlum.	Ventus.	Nubes.	Barom.	Th.	Pluvia.
	Nubilofum.	W S W 1		29 72	102	
5	Turbidum.	S W 5		70	122	
	Guttæ.			66	120	
		E b N 1	S b W	34	98	
10	Pluviosum.			32	117	
				25	106	
	Gelu cum	N o		82	79	
15	Apricitate.			90	116	
	Nubilum.			96	98	
	Nubilofum.	W b S 1		91	101	
20	Placidius.	W 2		92	134	
				85	120	
	Pruina. To-	W o	N b W	70	85	
25	nitru cum	I	N b W	80	125	
	Grand.pluv.			87	117	
	Sudum	W b N 1		68	100	
30	&					1.
	Calidum.			73	109	5 15.



M A I U S.						
		5 . . . 12.			9	
	Cœlum.	Ventus.	Nubes.	Barom.	Th.	Pluvia.
5	Dies nubi- lofus.	S W b S 1 S b W 3		29 61 56 55	115 150 120	
10	Nubilum. Apricum.	S S W 1 W b N 2	N W	30 07 05 29 98	104 142 124	
15	Imbres Grandinis & Pluviæ.	NW b N 2		80 95	92 97	0 22
20	Nubilum. Apricum.	N 1 N b E 2		78 78 80	106 124 113	
25	Nubilum & Frigidum. Clarius.	N b E 2 N 2	N N E	85 91 96	93 120 101	
30	Nubilum & Frigidum.	W b N 1		71 85	98 99	1. 2. 03

J U N I U S.						
		5 . . . 12 . . . 9				
	Cœlum.	Ventus.	Nubes.	Barom.	Th.	Pluvia.
5	Nubilum & Calidum. Guttæ.	S W 1 N N W 1	W W N W	29 62 65 64	119 143 126	
10	Apricum cum Calore. Nubil. Pluv.	E S E 2 E b S 2	S E b S	30 03 01 29 94	110 153 126	0 30
15	Nebula. Apricitas fervida.	W b S 1 2		92 92 93	127 152 132	
20	Nubilum. Fervidum. Minus fervi.	E 1		95 94	125 125	
25	Nubilum. Guttæ. Imber.	S W b W 2 W 3		62 59 50	137 151 131	0 08
30	Nebula. Apricitas. Fervida.	N 0 W 1		84 92 94	106 156 134	1. 3 29



J U L I U S				5 . . . 12 . . . 9			
	Cœlum.	Ventus.	Nubes.	Barom.		Th.	Pluvia.
5	Apricum.	W 0	N W	30	08	122	
	Pluvia.	N W 2			08	139	
	Pluvia.				10	116	0 82
10	Nubilum.	N b W 3		29	79	112	
	Imber & minus calidum	5			88	120	
				30	00	118	
15	Apricum.	E b S 0		29	96	112	
	Fervor æstuosus.	S 2	N		93	163	
					90	145	
20	Apricitas:	S W b W 0		30	03	115	
	cum fervore.	N N W 2			03	164	
	Nubilum.				03	136	
25	Nunc Apricum:	W b S 0		29	72	110	
	Nunc Nubilum.	S b W 3	W		69	170	
					66	148	
30	Apricum.	W b S 1			79	116	
	Nubilum.	S W 2			82	151	1.
	Minus nubi.				82	135	5 56

A U G U S T U S				5 . . . . 12 . . . 9			
	Cœlum.	Ventus.	Nubes.	Barom.		Th.	Pluvia.
5	Nubilum.	W S W 1	W	29	82	133	
	Minus Nubilum.	W b N 1			86	158	
					86	148	
10	Apricitas	S S W 3	S W		48	131	
	Ventosa.	SW 6			56	158	I 00
	Nubilofum.				44	138	
15	Turbidum.	S W 0			97	109	
	Nubilofum.	S S W 1			94	153	
					82	132	
20	Apricum.	S 1	S W		61	120	
	Guttæ.						
	Minusnubil.				65	129	
25	Apricum.	W 1	N W		34	105	
	Guttæ.	W N W 6			42	128	
	Minus nubi.				49	117	0 07
30	Multa Pluvia.	S 1	S S W		68	127	
		S b W 4			71	142	1.
					71	124	10 81



SEPTEMBER.						6 . . . . . 12 . . 9	
Cœlum.	Ventus.	Nubes.	Barom.		Th.	Pluvia.	
5 Nunc Apri- cum, nunc Nubilum.	SW b W 0 3	WSW	29	88 88 84	107 144 118		
10 Nubilum. Imber.	SSW 0	SW sup. NW inf.		77 86	102 108		
15 Nubilum. Nebulosum. Nubilum.	WNW 0 W 1	NbW NW	30	13 15 15	119 145 129		
20 Nubilosum.	E 1 EbN 4			25 25 22	124 138 128		
25 Pluviola.	SW b S 1 SSW 0		29	36 38 40	110 122 113		
30 Pruina & Apricitas.	NW 0 WbN 1			48 50 42	93 112 92	2	04

OCTOBER.						7 . . . . . 12 . . 9	
Cœlum.	Ventus.	Nubes.	Barom.		Th.	Pluvia.	
5 Nunc Im- bres, nunc Apricum.	SI SbW 2		28	93 99 10	111 127 111	0	56
10 Nebula crassa. Apricum.	SE 0 ESE 0			93 98 05	101 128 108		
15 Nubilosum. Apricum.	WSW 2	W	29	75 78	98 108		
20 Apricum. Nubilum. Tonitru, &c.	SE 1 EbS 2 ENE 2	SEbE	29	18 16 22	86 112 108	5	69
25 Apricum & Frigidum.	N 2 3			86 92 04	86 103 87		
30 Gelu cum Apricitate.	NbE 2		29	94 30 00	87 89	1.	16 01.



N O V E M B E R.				8 . . . . . 12 . . . . 9			
	Cœlum.	Ventus.	Nubes.	Barom.		Th.	Pluvia.
5	Gelu, & Apricitas. Nubilum.	E N E 1 E b N 1	E	29	68 72 72	83 103 101	
10	Nubilum.	S 2			80	103	
	Pluviofum.	6			44	120	0 27
15	Gelosum & Apricum.			30	05	80	
20	Nebula craf- fa. Pluvia. Turbidum.	N 2 W 1 9		29	57 57 35	89 89 98	0 91
25	Gelu & nebula te- nuis.	W 0			65 67 71	79 85 76	
30	Neb. tenuis. Nubilum Pluit.	S b W 2 4	S S W		10 10 28	102 112 111	5 84

D E C E M B E R.				8 . . . 12 . . . . 9			
	Cœlum.	Ventus.	Nubes.	Barom.		Th.	Pluvia.
5	Nunc Nu- bilum, nunc Apricum.	W 2 W b N 3	N W	29	10 25 46	92 102 92	
10	Nubilum.	N N W 1			45 61	88 89	
15	Pluviola. Pluit.	S W b W 1 W b S 3			34 36 31	100 101 95	1 21
20	Pluit. Clarius. Gelu.	S 1		28	73 73 76	94 100 84	1 83
25	Nubilum. Pluvia. Nivosa.	N b E 1	N N E	29	72 76 90	94 96 88	0 48
30	Caliginosu.	S E b S 1 S E 1			92 90 86	87 88 85	21 70



Quatuor Plagæ principales his literis notantur, viz. N. Septentrio : S. Meridies : E. Oriens : W. Occidens. Plagæ intermediæ harum literarum conjunctione denotantur. Cyphra [0] notat Aeris tranquillitatem, five nullum flare Ventum. [1] Ventum adeo languidum denotat, ut candelam accensam vix extinguere valeat. [2] fortiolem. [7, 8 ad 12, 15 vel 20] denotant Ventos violentos, & magis bacchantes.

Quoad Columnam *Thermometri*, notandum est, *Gelationis* gradum esse circa 85. Sed Pruina eveniet circa 90, vel paulo supra.

In Columna *Pluviarum*, aliquando notavi Pluviæ pondus, quod in diebus pluviosis (in Tabula notatis) decedit. Et in fine cujusque Mensis Summa Pluviæ totalis istius mensis notatur. In toto hoc Anno 84,62 Libræ Pluviæ deciderunt, istarum Librarum quas Angli *Troy-weight* vocant. *Infundibulum* Pluviam recipiens est circulare, cujus Diameter 12. pollicibus Anglicanis æqualis est.

Horæ observandi in summitate cujusque mensis notantur.

Circa finem Februarii, & per maximam Martii partem, Nostrates *Dyspnæa*, & *Tussi* ubique fere affecti sunt.

Aug. 11. Ventus adeo bacchatus est, ut perniciosissimus arborum fructibus, eorumque emptoribus fuerit.

Et quamvis pluvia copiosa successit, tamen Stagna arida fuere in Septembre, & magna Graminis inopia.

Dec. 19. Maximus fuit (ut opinor) *Mercurii in Barometro Descensus* hoc mane; sequenti modo,

8h. $\frac{1}{4}$ mane	—————	—————	28,28 pollices.
10	—————	—————	28,06
11	—————	—————	27,94
11 $\frac{1}{2}$	—————	—————	27,94
12 $\frac{1}{2}$	—————	—————	28,03
1 p. m.	—————	—————	28,13
1. 10.	—————	—————	18
1. 20' Ventus W 7	—————	—————	20
2 Ventus W 9.	—————	—————	34

Cœli autem Tempestatumque mutationes non adeo notabiles, ac Mercurii. Tantum ventus post meridiem vehemens fuit, & noctu multum Pluviæ. Sed audivimus calamitosissimam tempestatem Corbili eodem die fuisse.

Hic maximus Mercurii descensus ab aliis observabatur. In Observatorio Grenovicensi ad 27,80 pollices Mercurius descendebat; Cantuariæ urbis, ad 27,90.

Si terra non absorpsisset Pluviam, ad 16,924 pollices Anglicanos fere exurrexisset. Hic Annus ideo pro sicco habendus est. Nam proportio Pluviæ media singulis Annis est circa 20  $\frac{1}{2}$  pollices *Upminstri*; 42  $\frac{1}{2}$  *Townelei* in Comitatu *Lancastriæ*; & 22 *Parisiis* in *Gallia*; & 24 pollices in urbe *Flandriæ* vocata *Insula*.

D. M.



XI.  
The Weather,  
in a Voyage to  
China,  
in 1700. by  
Mr. James  
Cunningham,  
n. 1639.

D. M.	Ther. Alt.	Philo. Ba. Al.	Latitude N. or S.	Long. E. fr. S. Jago.	Needles Variatio	Needles Depressi.
Jan. 31	5 Divi.		1° 26' N	6° 16' E		80 30' N.
Feb. 1	4		1 18 N	6 11 E		
2	5		1 14 N	6 13 E		
3	5		1 07 N	5 57 E		
4	2		0 27 N	5 49 E		
5	4		0 00	5 44 E		
6	4		0 30 S	5 35 E		
7	5		1 46 S	5 08 E		3 30 S
8	4½		3 00 S	4 56 E		
9	5		4 29 S	4 19 E		
10	5		5 57 S	3 54 E		10 00 S
11	6		7 10 S	3 05 E	20 17' E	
12	6		8 46 S	2 22 E	2 20 E	
13	8		10 29 S	1 37 E	2 50 E	
14	7		12 05 S	1 20 E	3 30 E	
15	7½		13 44 S	1 10 E	4 12 E	
16	7½		15 09 S	1 10 E	4 10 E	19 00 S
17	8		16 32 S	1 14 E	4 52 E	
18	8½		18 01 S	1 19 E	5 14 E	
19	7½		19 14 S	1 29 E	5 42 E	30 00 S
20	8		20 05 S	1 15 E	6 18 E	
21	7		21 16 S	1 35 E		
22	7		22 23 S	1 54 E	7 02 E	
23	5		23 47 S	2 39 E		
24	5		25 21 S	3 28 E		
25	6½		26 38 S	4 09 E	8 00 E	39 00 S
26	6½		27 49 S	4 52 E		
27	8		29 16 S	6 07 E		
28	8		30 01 S	7 34 E		
29	10½		31 26 S	10 20 E		
Mar. 1	12½	8	31 10 S	11 49 E		
2	13	10	31 16 S	13 57 E	4 50 E	42 00 S
3	17½	14	31 13 S	16 04 E		
4	23½	18	30 26 S	17 51 E		
5	26	19½	30 58 S	17 17 E		
6	24	20	32 07 S	17 08 E	3 05 E	
7	23	26	33 06 S	16 54 E		
8	32	32	33 14 S	18 26 E	2 05 E	
9	33	38½	32 43 S	19 59 E		
10	29	34	32 27 S	21 13 E		
11	29	32½	32 01 S	22 32 E		
12	28½	33½	32 36 S	22 23 E		



D. M. Ther.	Philos.	Latitude	Long. E.	Needles	Needles
Alti.	Bar. Al.	N. or S.	fr. S. Jago.	Variatio.	Depressi.
13	27	34	33 42 S	22 42 E	
14	26	31	34 08 S	23 23 E	15 E
15	26	30	34 10 S	25 26 E	0 57 E
16	24	30	34 36 S	27 45 E	0 20 E
17	25	30	34 54 S	29 48 E	0 22 W
18	25 $\frac{1}{2}$	30	34 59 S	33 27 E	1 19 W
19	34	38	34 44 S	36 25 E	47 00 S
20	26	31 $\frac{1}{2}$	34 22 S	37 45 E	6 25 W
21	28	33	34 29 S	39 04 E	
22	37	42	34 08 S	41 31 E	
23	39	36	34 35 S	43 41 E	7 05 W
24	26 $\frac{1}{2}$	32	34 08 S	45 06 E	8 20 W
25	27	30 $\frac{1}{2}$	33 58 S	47 02 E	8 52 W
26	25 $\frac{1}{2}$	26 $\frac{1}{2}$	33 35 S	48 32 E	9 43 W
27	27	29	33 51 S	49 56 E	10 39 W
28	35 $\frac{1}{2}$	38 $\frac{1}{2}$	34 03 S	50 36 E	
29	33	34 $\frac{1}{2}$	34 03 S	50 36 E	
30	30	31	34 03 S	50 36 E	48 00 S
31	26	25	34 03 S	50 36 E	

Apr. 1 — At the Cape of Good Hope  
 8 30  $\frac{1}{2}$  | 34 | Longitude  
 from thence

11	31	29	34 45 S	00 43 W	
12	26	28	35 01 S	00 25 W	11 29 W
13	33	42 $\frac{1}{2}$	35 30 S	00 08 W	
14	34 $\frac{1}{2}$	44 $\frac{1}{2}$	36 52 S	00 36 W	
15	25 $\frac{1}{2}$	29	37 51 S	00 13 W	
16	27	31 $\frac{1}{2}$	37 57 S	01 03 E	12 40 W
17			37 41 S	2 38 E	
18	31	38	38 45 S	3 29 E	
19	26	34	39 53 S	4 50 E	
20	31	39	40 42 S	5 58 E	
21	32 $\frac{1}{2}$	34	41 06 S	7 49 E	
22	40	45 $\frac{1}{2}$	39 52 S	10 06 E	
23	38	44	38 51 S	11 34 E	19 06 W
24	32	33 $\frac{1}{2}$	39 09 S	11 50 E	
25	39 $\frac{1}{2}$	41	39 14 S	14 37 E	
26	46	55	38 00 S	17 06 E	diff. 8°
27	36	45	37 41 S	19 10 E	60 00 S
28	31	37	37 45 S	21 35 E	21 23 W
29	25	36	37 27 S	23 32 E	
30	23	33	37 30 S	23 57 E	22 27 W



D. M.	Ther. Alti.	Philof. Bar. Al.	Latitude N. or S.			Long. C. Gd. Hope.			Needles Variatio.	Needles Depressi.	Diff.
May 1	33	42	37	58	S	25	24	E			
2	32	45	38	16	S	27	08	E	24 30 W		
3	32	40	38	47	S	29	40	E			
4	30	31 $\frac{1}{2}$	38	50	S	33	20	E			
5	27	37	38	43	S	36	20	E		60 00 S	7°
6	38 $\frac{1}{2}$	45 $\frac{1}{2}$	38	35	S	39	54	E			
7	38 $\frac{1}{2}$	45 $\frac{1}{2}$	38	17	S	42	07	E		69 00 S	8
8	46 $\frac{1}{2}$	53	37	49	S	45	51	E	24 20 W		
9	35	40	38	48	S	49	19	E			
10	32	39	38	30	S	52	41	E	24 00 W	72 00 S	8
11	35	46	38	09	S	56	08	E			
12	32 $\frac{1}{2}$	42	37	25	S	58	16	E			
13	33 $\frac{1}{2}$	47 $\frac{1}{2}$	37	25	S	59	11	E	20 48 W		
14	34	45 $\frac{1}{2}$	37	10	S	60	54	E	20 00 W	75 00 S	8
15	30	38 $\frac{1}{2}$	37	13	S	63	29	E	19 00 W		
16	34	41	36	53	S	65	04	E	18 43 W	70 00 S	6
17	31 $\frac{1}{2}$	36 $\frac{1}{2}$	36	48	S	68	14	E	17 40 W		
18	35	41	36	56	S	71	12	E		68 00 S	8
19	35 $\frac{1}{2}$	41	36	00	S	74	16	E			
20	31	34	35	01	S	76	39	E			
21	32 $\frac{1}{2}$	37	34	07	S	78	32	E	14 28 W	68 00 S	8
22	27	35 $\frac{1}{2}$	33	07	S	81	05	E	14 00 W		
23	28 $\frac{1}{2}$	24 $\frac{1}{2}$	32	53	S	83	36	E	13 30 W		
24	35	33	31	35	S	85	13	E			
25	29 $\frac{1}{2}$	30 $\frac{1}{2}$	30	11	S	86	28	E		68 00 S	8
26	31	34 $\frac{1}{2}$	29	27	S	87	06	E	10 04 W		
27	31	35	28	01	S	87	59	E			
28	30	33	25	55	S	89	24	E	8 58 W		
29	27	20	23	59	S	90	29	E			
30	25	24	22	49	S	91	32	E	8 12 W	62 00 S	8
31	22	22	21	23	S	92	42	E	7 00 W		
June 1	19	19	19	54	S	93	20	E	6 35 W		
2	17	17	18	02	S	94	10	E			
3	14	13	16	30	S	94	55	E	4 40 W		
4	12	10	15	02	S	95	15	E	4 50 W	53 00 S	7
5	7 $\frac{1}{2}$	7	13	40	S	95	34	E	5 12 W		
6	5	3	13	01	S	95	42	E	5 20 W	52 00 S	4
7	5	3	12	59	S	95	56	E	5 15 W		
8	5	3	12	26	S	96	17	E	4 42 W		
9	5 $\frac{1}{2}$	1	11	43	S	96	28	E	4 26 W		
10	5	1	11	10	S	96	34	E	3 52 W		
11	4	0	10	18	S	96	54	E	3 32 W		
12	5	1	8	45	S	97	37	E	3 26 W	46 00 S	6
13	5 $\frac{1}{2}$	1	7	52	S	97	21	E	3 12 W		



D. M.	Ther. Alt.	Philo. Ba. Al.	Latitude N. or S.		Long. fr. C. Gd. Hope.		Needles Variatio.	Needles Depressi.	Diff.
14	4 $\frac{1}{2}$	0	7	23 S	95	56 E			
15	5	0	6	45 S	95	16 E			
16	4	0	Betwixt Java Head and Batavia.						30
17	2 $\frac{1}{2}$	0							
18	2	0							
19	2	0							
20	1	0			Longitud. fr. Batavia.				
21	1	0						40 00 S	
22	1 $\frac{1}{2}$	0			00	05 W			
23	4 $\frac{1}{2}$	0	5	27 S	00	47 E			
24	2	0	5	24 S	1	48 E			
25	3	0	5	51 S	1	55 E			
26	6 $\frac{1}{2}$	2 $\frac{1}{2}$	6	12	1	51		38 00 S	4
27	5	0	6	16	1	59			
28	5	0	6	29	2	02			
29	5	0	6	21	2	18			
30	5	0	6	29	2	33			
July 1	4	0	6	44	2	43			
2	4 $\frac{1}{2}$	0	6	39	2	55			
3	3 $\frac{1}{2}$	0	6	35	3	34			
4	3 $\frac{1}{2}$	0	6	30	3	49			
5	5	0	6	35	3	49		45 00 S	8
6	8	2	6	12 S	4	07 E			
7	6	0	6	21	4	28			
8	6	0	6	22	4	43			
9	6	1	6	28	5	13			
10	8 $\frac{1}{2}$	3	6	50	5	37	1 25 W	41 30 S	2
11	6	0	6	44	5	47			
12	5	$\frac{1}{2}$	6	23	6	05			
13	5	0	6	05	6	17			
14	6	2	5	10	6	54			
15	4	0	4	20	7	09			
16	5	0	4	08	7	27			
17	5	0	4	00 S	7	30 E	At the Bar of Banjar [on Borneo,		
18	8	4	4	00 S	7	30			
19	7 $\frac{1}{2}$	1	4	00	7	30			
20	6	0	4	15	7	06		40 00 S	0
21	5	0	4	51	5	06			
22	2 $\frac{1}{2}$	0	4	59	3	12			
23	4	0	4	45	1	25			
24	7	4	4	09	0	17			
25	5	0	4	01	0	13		35 00 S	6
26	1 $\frac{1}{2}$	0	3	32					



M. D.	Ther. Alt.	Philo. Ba. Al.	Latitude N. or S.		Needles Variatio.	Needles Depressi.	Diff.
27	3	0	In the Streights of Banca				
28	5	0					
29	4 $\frac{1}{2}$	0	I 59 S	Longitu.			
30	4	0	0 31	from Pulo	I 50 W		
31	4	0	I 25 N	Condore.		31 00 S	50
Aug. 1	2 $\frac{1}{2}$	0	3 19	I 36 W			
2	I	0	5 07	0 52			
3	I	0	6 04	0 25			
4	I	0	7 47	0 08 E			
5	3 $\frac{1}{2}$	0	9 16	I 25			
6	2	0	10 14	3 07			
7	I	0	12 04	4 33 E		5 30 S	13
8	I	0	14 05	5 58		4 00 S	12
9	I $\frac{1}{2}$	0	16 15	7 02			
10	2 $\frac{1}{2}$	0	18 14	7 20			
11	I $\frac{1}{2}$	0	19 49	7 12			
12	I $\frac{1}{2}$	0	21 17	7 02		2 30 S	I
13	ab. I $\frac{1}{2}$	0	21 58	7 36			
14	bel. I	0	22 15	7 47		6 00 N	2
15	I	0	22 18	8 09			
16	0	0	22 32	8 43	I 20 W		
17	$\frac{1}{2}$	0	23 10	9 48			
18	I $\frac{1}{2}$	0	23 32	10 04 E			
19	2 $\frac{1}{2}$	0	23 56	10 18			
20	4	0	24 12	10 28			
21	I	0	24 22	10 43		12 00 N	6
22	3	0	24 32	11 01			
23	4 $\frac{1}{2}$	0	24 47	11 15			
24	6	0	24 56	11 28			
25	5	0	25 09	11 38			
26	6	0	25 09	12 08			
27	5	0	25 07	12 20			
28	5	0	25 29	11 50			
29	4	0	25 37	12 02 E			
30	3 $\frac{1}{2}$	0	25 49 N	11 47			
31	2	0	26 02	11 53			
Sept. 1	2 $\frac{1}{2}$	0	26 05	11 56	At Crocodile Island.		
9	3	0	25 44	12 38			
10	3 $\frac{1}{2}$	0	26 11	12 13			
11	5	0	26 11	12 47			
12	4 $\frac{1}{2}$	0	26 22	12 37			
13	8 $\frac{1}{2}$	0	26 26	12 40			
14	6 $\frac{1}{2}$	0	26 37	12 59			



Chap. I.

Observations of the Weather, &c.

D. M.	Ther.	Philof.	Latitude	Long. fr.	Needles	Needles	Diff.
	Alti.	Bar. Al.	N. or S.	Pul. Con.	Variatio.	Depressi.	
15	5	0	27 05 N	13 11 E			
16	7	0	26 55	14 01			
17	8	0	27 07	14 15			
18	10	7 $\frac{1}{2}$	27 26	14 13			
19	9	6 $\frac{1}{2}$	27 42	14 02			
20	7 $\frac{1}{2}$	4	27 46	14 25			
21	12	10	28 03	14 25			
22	15	12 $\frac{1}{2}$	27 49	15 31			
23	17	14	27 51	15 01			
24	14	13	27 53	16 26			
25	14	12	28 10	15 36			
26	13 $\frac{1}{2}$	13	28 47 N	15 04 E		17 30 N	50
27	14	13	29 06	14 49			
28	15 $\frac{1}{2}$	17	28 55	15 09	I 00 N		
29	15	13	29 02	15 09			
30	15	17	29 43	15 19			
Oct. 1			29 56	14 55			
2			29 56	14 55			
10	20	20	29 56	14 55			
11	12		30 25	14 20			
12	17	15	30 25	14 20	At Chusan.		
13	25	32					
14	24	30	30 25 N	14 20 E	00 56 E	21 00 N	
15	22	28					
16	25	29					
17	16	14					
18	15	13					
19	23 $\frac{1}{2}$	31					
20	24	30					
21	24	29					
22	25	30					
23	26	30					
24	27 $\frac{1}{2}$	32					
25	24	28					
26	22 $\frac{1}{2}$	26					
27	20	27					
28	36 $\frac{1}{2}$	45					
29	45	58					
30	46	59					
31	47	65					



*Jan.* 31. Variable Breezes, and 10 Hours calm; rainy and cloudy.  
*Feb.* 1. N S by W S W by S and 16 Hours calm, rainy and cloudy with Lightning. 2. Variable Breezes, and eleven Hours calm, fair. 3. Variable, fair with Rain at Noon. 4. Variable, fair and cloudy, Rain in the Forenoon. 5. Variable with 9 Hours calm, rainy and cloudy. 6. Variable with 4 Hours calm, fair and cloudy, with some Rain. 7. Small Gales from E by S to S E by S, Fair and cloudy. 8. Easy Gales from E by S to S E by E, Fair and pleasant. 9. Easy at E S E, and S E by E, Fair and pleasant. 10. Easy at S E by E, and S E, Fair and pleasant. 11. Fine Gales S E by E, Fair and pleasant. 12. E S E fine. Fair and pleasant. 13. E S E and E by S, Fair and pleasant, with one Shower. 14. E by S and E, Fair and cloudy, with some Squales. 15. E by N to E S E, Fair with one Squale. 16. E by S and E, Fair and pleasant. 17. E, Fair and pleasant. 18. E, Fair and cloudy, with one Shower. 19. E by S to E by N, Fair with one Shower. 20. S E by E to E by N small, Fair and cloudy, with several Squales. 21. N N E to E by N easy, Fair with two Showers. 22. N N E to E by N, Fair with one Shower. 23. N N E to N N W, Fair and pleasant. 24. N N E to N E by E, Fair and pleasant. 25. N E by N to N N E, Fair and pleasant. 26. N E by E N, Fair and pleasant. 27. N to N W, Fair, sometimes cloudy. 28. W N W to W S W, Cloudy and squally, with Rain and Lightning. 29. W N W to N by E fresh, Squally with much Rain, and some Thunder.

*March* 1. N W to W moderate, uncertain with Thunder and Rain. 2. W to N W moderate; Fair and cloudy. 3. W to S fresh, cloudy and squally. 4. S by E to S E by E, Squally and cloudy. 5. E S E and E by S, Fair and cloudy. 6. E by S to E by N, moderate, Fair and cloudy. 7. E by N to S E by E, small, Fair and cloudy. 8. S E to S S W, moderate, Fair and cloudy. 9. S to S S W blowing hard, Close and squally. 10. S by E and S, moderate, Gray and cloudy. 11. S b E to S E by E, Squally, close and cloudy. 12. S S E to E by S, Dry, close and cloudy. 13. E by S to E by N, easy. Fair and close. 14. Variable and small, Fair and close. 15. N to N W by N easy, Fair and serene. 16. N by W to N N E, Fair and serene, sometimes close. 17. N by E to N N W, a fine Gale, Fair and serene. 18. N to N N W, Fair and serene, this Forenoon cloudy. 19. N N W to S W, and S by W, thick and squally, this Forenoon fair. 20. S W to N to N W easy, Fair and cloudy. 21. N W by N to W easy, fair and cloudy. 22. W to S S E fine, Fair and sometimes squally. 23. S to W S W fine, Variable weather. 24. S S W W S W small, Fair and pleasant. 25. S W by S to S E S easy, Variable. 26. S E by S to S by W moderate. Fair and Cloudy. 27. S W by S to S moderate, Variable. 28. S W b S to S by W small, Fine moderate weather. 29. S E small, sometimes fresh, Fair and pleasant. 30. S W to S E, most part calm, Fair and pleasant. 31. Variable Breezes and calm, Fair and pleasant.

*April* 1. S to S E, small, The same. 2. S E small, the same. 3. S E, and S E by S, moderate, the same. 4. S E and S S E small and calm, the same. 5. S E by S small, at night fresh, the same. 6. S E small, the same. 7. Variable and calm, the same. 8. Calm, at night blowing fresh,



fresh, the Forenoon foggy, Afternoon clear'd up. 9. S S E and S by E, blowing hard, Fair and hazy. 10. S S E, fine Gales, Fair and pleasant. 11. S E by S to N E moderate, Fair and gray. 12. Variable and small, Fair and cloudy. 13. S S E to S E by E, moderate, Squally. 14. S E to E by N, Variable. 15. E to E N E small, Fair and cloudy. 16. S by E to S W by S, small, sometimes calm, Variable. 17. S S W by E S E, Variable. 18. E by S to E N E small, Fair and close. 19. E by S to N E by N moderate, Fair and cloudy. 20. N E by E to E by S moderate, Cloudy and overcast. 21. N E by E to N E by N easie, Moderate Weather. 22. W S W to S E fresh, Variable. 23. S E to S S E small, Fair and cloudy. 24. S E by N N E small, Fair and pleasant. 25. Variable Gales, Fair and cloudy. 26. W by N to S W, blowing hard, Variable with Rain and Hail. 27. S W by S to W N W fresh, Close and cloudy. 28. W N W to N W by N moderate, Fair, somewhat cloudy. 29. N W to S W easie, Variable. 30. W S W to S E by S small, Close Weather.

*May* 1. N N E to E small, Close and cloudy. 2. N E by E to N by E easie, close. 3. N E by N to N N W fresh, Close and squally. 4. N N W to N W fresh, Fair and cloudy. 5. N W to S W, fresh, Variable and squally. 6. N W to S W hard, Variable and squally. 7. W N W to S W moderate, Fair weather. 8. W N W to S W by W fresh, Variable. 9. W S W and W N W fresh, Variable. 10. W by N to N W by W fresh, Variable. 11. W N W and W fresh, Moderate with some Rain. 12. W to S W easie, the same. 13. S W to N N E small, Cloudy weather. 14. W N W to N W by N, small, Fair and pleasant. 15. W N W to S W fine Gales, Variable. 16. S W to W N W easie, Close and hazy with Rain. 17. W N W to N W fresh, Variable. 18. W N W and W by N fine, Fair and cloudy. 19. W N W and W fresh, Moderate. 20. N W by W to W fine, the same. 21. W by S to N W by N, the same. 22. N W by N and N W, the same. 23. N W by N to N E, Variable. 24. N by E to W by S, Thick and squally. 25. S W to W N W, Variable. 26. S W by W and S W by S, Fair and pleasant. 27. S W to S E small, the same. 28. S E and S E by E, Variable. 29. S E by E to S S E, Squally and rainy, with Thunder and Lightning. 30. S E and S E by E, Variable. 31. S E to S S E, Fair and serene.

*June* 1. S E and S E by E, Fair and pleasant. 2. S E by E and E S E, the same. 3. S E by E and E S E, the same. 4. E by S to E by N, the same. 5. E by N to E by S, the same. 6. E to N E by E, the same. 7. E by N to E S E, the same. 8. E by N to S E, the same. 9. E S E by E N E, the same. 10. E by N and E, the same. 11. E by N to E S E, the same. 12. E by S to E S E, the same. 13. E by S to N N E, the same. 14. E S E to N N E, the same. 15. S S E to S E, the same. 16. S S E S S W and calm, the same. 17. S S W S E and calm, the same. 18. S E and E by S, the same. 19. E N E and S E, the same. 20. N E by E to S S E, the same. 21. N N E to S, the same. 22. N to S S E, the same. 23. N W by W and S W, the same. 24. S by W and S E by E, Cloudy with some Rain. 25. E S E to N E by E, Squally.



Squally, with Thunder, Lightning and Rain. 26. *E S E* to *N E* by *E*, Cloudy, with Rain. 27. Close, the same. 28. *E* by *N* to *E S E* small, Variable. 29. *E S E* and *S E* small, Fair. 30. Variable Breezes, Uncertain.

*July* 1. *E* by *S* to *N E* by *E*, Fair with some Rain. 2. *N E* by *E* to *S E* by *E*, Fair and ferene. 3. *N E* by *E* to *S E* by *E*, Fair and ferene. 4. *N E* to *S S E*, the same. 5. *N E* by *N* to *S E*, the same. 6. *S E* small, the same. 7. *S E* to *S* by *E*, the same. 8. *S E* by *E* to *E N E*, the same. 9. *E* by *S* to *E* by *N*, the same. 10. *S E* by *E* to *E* by *N*, the same. 11. *E N E* to *S S E*, the same with some Rain. 12. *E* by *N* to *S E*, Fair and ferene. 13. *S E* to *E* by *S*, the same. 14. *S E* to *E S E*, the same with some Rain. 15. *S E* by *S* to *E S E*, Fair and cloudy. 16. *S E* by *E* to *N E* by *E*, Fair and ferene. 17. *E* to *S E* and calm, Fair and cloudy. 18. *E* to *S E* by *S* small, Close and cloudy with Rain. 19. *S E* fresh, Close and clearing up. 20. *S S E* to *S E*, Fair and ferene. 21. *S E* by *S* and *S E*, Fair and cloudy. 22. *S E* by *E* to *E* by *S*, the same. 23. *S* by *E* to *E* by *S*, Close with some Rain. 24. Variable, Squally with Thunder. 25. *S* to *E* by *S*, Fair and close with Lightning. 26. *E* by *S* to *S E* by *S*, Fair and ferene. 27. *E N E* to *S* by *E*, Variable. 28. *S E* by *S* to *S*, Fair and ferene. 29. *S E* by *E* to *S*, the same. 30. *S E* to *N N E*, the same. 31. *S S E* to *S E* by *S*, the same.

*Aug.* 1. *S S E* to *S* by *W*, Fair and close. 2. *S* by *W* to *S E*, Variable with Thunder and Lightning. 3. Variable, Fair and close. 4. *S S W* to *S W* by *S*, Fair and pleasant. 5. *W* to *S W*, Fair, close and hazy. 6. *S W* by *W* to *W*, Fair and hazy. 7. *S W* by *W* to *S W* by *S*, Fair and ferene. 8. *S W* and *S W* by *W*, the same. 9. *W* by *S* to *S W* by *S*, Fair and cloudy. 10. Variable, Squally. 11. *W S W* to *W N W*, blowing hard, Squally and much overcast. 12. *W S W* to *S S W*, moderate, Fair and close with some Rain. 13. *S S W* to *S E* by *S* small, Fair and ferene. 14. *S E* to *N N E*, Fair and pleasant with one Shower. 15. *E* by *N* to *N E* by *E*, Fair and pleasant. 16. Variable and calm, the same. 17. *W S W* to *S W* easie, Fair, with some drizzling Rain. 18. Variable and small, Fair and ferene. 19. *N* to *N E* by *N* fresh, the same. 20. *N E* by *E* to *N* by *E*, the same. 21. *N E* by *E* to *N* by *E*, the same. 22. *N E* to *N N E*, the same. 23. *N E* by *E* to *N N E* easie, Fair and pleasant. 24. *E N E* to *N E* by *N* fresh, Variable. 25. *E N E* to *N* by *E* moderate, Fair and pleasant. 26. *N* by *E* to *N E* by *E*, the same. 27. *E N E*, to *N N E*, the same. 28. *E* by *N* to *N N E*, Variable. 29. *N E* by *E* to *N*, Variable. 30. *N* by *E* to *N E* by *E* fresh, Close and squally. 31. *N E* by *N* to *E* by *N*, Variable.

*Sept.* 1. *N N E* to *N E* by *E*, Fair and pleasant. 2. *N E* small, The same with some Rain at Night. 3. *N N E* small, Fair and pleasant. 4. *N* by *E* to *N E*, the same. 5. *N E* moderate, Fair and cloudy. 6. *N E* fresh, at night *S W* blowing hard, the same, at night much Rain. 7. *N E* fresh and moderate, Cloudy with some Rain. 8. *N E* moderate, Fair and pleasant, at times overcast. 9. *N E* moderate, Fair and hazy.



10. *NE by N to NE by E*, the same. 11. *NE to NNE*, the same. 12. *NE by N to E by S* small, Fair and pleasant. 13. *ENE to NE* moderate, Fair. 14. *NNE to ENE*, Fair and cloudy. 15. *NE by E to E by N*, Fair, close and cloudy. 16. *ENE to N by W*, Fair and cloudy. 17. *N to NE by E*, the same. 18. *NE to N by E*, Variable. 19. *N by E to NE by E*, Fair. 20. *NE by E to N by E* fresh, Fair and cloudy. 21. *NE to NNE* moderate, Fair and pleasant. 22. *NE by N to N by E*, Fair with some Rain. 23. *NNE to N* fresh, Fair and cloudy. 24. *N by W to N by E* small, Fair, and much overcast. 25. *N by E. NE by N*, Fair and close. 26. *N by E to E by N*, Variable. 27. *NNE to NE by E*, Fair and pleasant. 28. *NNE to NE*, Fair and cloudy. 29. *NE by N*, Fair, sometimes close. 30. Variable from *SSW to NW*, Fair, pleasant and cloudy.

*Octob.* 1. *WNW to NE by E*, Fair and close. 2. *NNW and N* small, Thick and foggy with Rain. 3. *NNW to NW*, small, Variable, Forenoon serene. 4. *N to NE* moderate, Variable. 5. *NNW to NW*, blowing fresh, Fair and Cloudy. 6. Forenoon calm, Afternoon *SE* fresh, Fair and Serene. 7. *NNE to NE*, moderate, Cloudy with Rain. 8. *N to NNW*, Cloudy and overcast. 9. *N by W to NE*, Cloudy and hazy with Rain. 10. *NE to SE* moderate, Cloudy and fair. 11. *SE to SW* small, Fair and serene. 12. *SSW* small, the same. 13. *NNE to NE* Fair and cloudy. 14. *NE* moderate, Fair and cloudy. 15. *N* small, Fair and cloudy. 16. *NE to E* moderate, Cloudy with some Rain. 17. *SE* small, Thick and hazy with Rain. 18. *SE* moderate, Thick and hazy, with much Rain. 19. *NE* small, Fair and cloudy. 20. *NNE to ENE*, the same. 21. *NNE to SE*, Cloudy with some Rain. 22. *N to W* fresh, Fair and cloudy. 23. *N by W to WNW* small, Fair and pleasant. 24. *S and SSE* small, the same. 25. *SE* moderate, the same. 26. *SE to S by E* moderate, the same. 27. *NW to N by W* moderate, Cloudy with some Rain. 28. *NW* small, sometime fresh, Thick and hazy with Rain. 29. *NW to N* moderate, the same. 30. *NNW to N by E* small, Fair and cloudy. 31. *NW* small, the same.

*Note 1.* That the Altitude of the Spirits in the Thermometer was taken below extream Heat, and the Observations of that, and of the Philosophical Barometer were commonly taken at Noon. 2. The account of the Winds and Weather at Sea, is from Noon to Noon.

3. The middle Inclination of the Dipping Needle is set down with the difference also which was made, as either side of the Compass was turn'd East or West: which difference at first was not taken notice of. From whence this difference should arise I cannot determine, the Compass seeming to be justly pois'd and equally divided.

XII. The following Observations were of a portable Barometer from *England*; which by a Barometer set up here were always  $\frac{6}{10}$  of an Inch lower: And the Barometer stood about 18 Feet above the Superficies of the Sea at high Water.

*Weather, &c. at Chusan, by the same, 16. p. 1648.*

N O V E M -



N O V E M B R 1700.

1. Grey cloudy Weather, very cold and moderate Gales from NW to N.
2. Grey cloudy Weather, with moderate Gales from NW to N. and very cold.
3. Grey cloudy Weather, very cold and small Gales from N by W and NNW. At Night little Wind, and more serene.
4. Grey cloudy Weather, very cold and moderate Gales at NNW and N by W.
5. Fair and serene Weather, with small Gales from NNW to N. The Air temperate.
6. Fair and pleasant Weather, with small Gales at NW and NNW.
7. Fair and pleasant Weather, somewhat hazy, and small Gales at NNW. At Night calm.
8. Fair and pleasant Weather, with small Gales at N. At Night little Wind.
9. Fair and serene Weather, with small Gales at N. At Night calm.
10. Very serene and warm Weather, with small Gales at N by W. In the Night calm.
11. Dry and serene Weather, with small Gales from SE. At Night calm.
12. Dry and serene Weather, with small Northerly Breezes. At Night calm.
13. The Morning foggy, all day serene with small Breezes at NNW.
14. The Morning grey and cloudy, towards Noon, thick hazy Weather with drizzling Rain till 8 at Night. All Day fresh Gales from W by S to NW. At Night less Wind and fair.
15. Grey cloudy Weather, with moderate Gales from NW to N.
16. Fair and pleasant Weather with small Gales from N to N by E.
17. Dry and serene Weather, with small Gales at N and NNW.
18. Grey cloudy Weather, with moderate Gales from NW to W. In the Night cold.
19. Dry Weather, somewhat cloudy, with small Gales from NW to N. Cold at Night.
20. Dry and pleasant Weather, with small Gales at NNW.
21. Fair and pleasant Weather, with small Gales from W by S to NW.
22. Fair and pleasant Weather, somewhat hazy with Gales at SE.
23. Fair and pleasant Weather, the Afternoon overcast, with moderate Gales at NW to N.
24. Dry Weather, somewhat cloudy, with moderate Gales from NW to N.
25. Fair and pleasant Weather, with small Gales from N by W. At Night calm and cold.
26. Fair and pleasant Weather, with small Breezes at NW for the most part calm. Mercury Altitude  $30 \frac{8}{10}$ .

27. Grey



27. Grey cloudy Morning, with small Gales at W N W. *Mercury's* Altitude  $30 \frac{6}{10}$ . In the Afternoon fair and pleasant with small southerly Breezes. At Night calm.

28. Fair and pleasant Weather, with small Gales at N W. *Mercury*  $30 \frac{6}{10}$ . The Afternoon small Breezes at S W. At Night calm, and the Breezes veering to N, the Air temperate. *Mercury*  $30 \frac{4}{10}$ .

29. Fair and serene Weather, with Calms. *Mercury*  $30 \frac{5}{10}$ . In the Afternoon small Gales at S E. At Night grey cloudy Weather, the Gale veering to N. *Mercury*  $30 \frac{6}{10}$ .

30. A grey cloudy Morning, with moderate Gales at N W and W N W. *Mercury*  $30 \frac{6}{10}$ . All day more serene. In the Evening overcast, and some Rain at 9 at Night.

D E C E M B E R. 1700.

1. Grey cloudy Weather all day and night, with fresh Gales from N to N E. *Mercury*  $30 \frac{2}{10}$  falling to  $30 \frac{8}{10}$ .

2. In the Morning fair and serene. *Mercury*  $30 \frac{5}{10}$ . Since overcast and grey cloudy Weather, with moderate Gales at N N E and N. In the Evening some Drops of Rain, and sometimes blowing fresh in the night and very cold.

4. Grey cloudy Weather, with moderate Gales at N to N W. *Mercury*  $30 \frac{1}{10}$ , at night falling to  $30 \frac{1}{10}$ , then almost calm.

5. A grey cloudy Morning, towards Noon more serene. *Mercury*  $30 \frac{1}{10}$ . Fresh Gales at N E. in the Evening overcast with some drops of Rain. Little Wind all night.

6. A grey Morning somewhat cloudy, and a small Breeze at N N E. *Mercury*  $30 \frac{2}{10}$ . In the Afternoon overcast, with the Wind at S. and small drops of Rain. The *Mercury* falling to  $30 \frac{8}{10}$ . Some Rain in the night.

7. Close thick Weather, with drizzling Rains all day and night, and small Winds at N N E and N. *Mercury*  $30 \frac{2}{10}$ .

8. A grey cloudy Morning, with some drizzling Rain, and moderate Gales at N and N by W. *Mercury* rising above  $30 \frac{7}{10}$ . All day and night overcast; the *Mercury* as before.

9. A grey cloudy sharp Morning, and small Winds at N N W. *Mercury*  $30 \frac{6}{10}$ . Cloudy all day, and towards Evening close Weather and calm, *Mercury*  $30 \frac{5}{10}$ .

10. Dry Weather, somewhat grey and cloudy with small Breezes at N N W. *Mercury*  $30 \frac{4}{10}$ . All day overcast with variable Breezes intermixt with Calms, *Mercury* as before.

11. Fair and pleasant in the Morning, since overcast with variable Breezes, the *Mercury* as before.

12. Grey cloudy Weather, in the Forenoon small Gales at S E. *Mercury*  $30 \frac{4}{10}$ . In the Afternoon the Gale freshning at N W. *Mercury*  $30 \frac{5}{10}$ . With some Rain all night.

L

13. Grey



13. Grey cloudy Weather, with moderate Gales from N W to N Mercury  $30 \frac{4}{5}$ . Cold at night.

14. A sharp Morning and fair pleasant Weather, with small Gales at N N W and N. Mercury  $30 \frac{6}{5}$ . At night Calm, Mercury  $30 \frac{5}{5}$ .

15. Fair and pleasant Weather, with moderate Gales at S E. Mercury  $30 \frac{4}{5}$  falling to  $30 \frac{3}{5}$ .

16. The Morning somewhat cloudy, with small Gales at S E (Mercury  $30 \frac{2}{5}$ .) At noon veer'd to N W. and the Sky overcast; at night some Rain, much Wind and Cold.

17. A sharp Morning and grey cloudy Weather, with moderate Gales from N W to N N W Mercury  $30 \frac{7}{5}$ . All day overcast, at night little Wind and much Rain.

18. Thick close Rainy weather, all day and night with small Gales at N W.

19. Grey cloudy Weather, with moderate Gales at N W to N. Mer.  $30 \frac{6}{5}$ . Some Rain at night and very Cold.

20. Grey cloudy weather with moderate Gales at N N W, and cold, Mercury  $30 \frac{7}{5}$ . At night little Wind.

21. Grey cloudy Weather and cold, with moderate Gales from N N W to N W Mercury  $30 \frac{7}{5}$ . At night drizzling Rains. Mercury  $30 \frac{6}{5}$ .

22. In the Morning close Weather, with drizzling Rains and moderate Gales at N W and N N W Mercury  $30 \frac{6}{5}$ . The Afternoon dry, grey and cloudy.

23. A grey cloudy Morning and Calm, Mercury  $30 \frac{5}{5}$ , towards noon more serene and a small Breeze at E S E. In the evening overcast with some Rain and fresh Gales, all night at N N W.

24. Grey cloudy Weather, somewhat close, with fresh Gales from N N W to N W by W.

25. Grey cloudy Weather, with moderate Gales at N W.

26. Close Weather with drizzling Rains, and small Breezes at N E, for the most part calm. In the night the Gale freshned at N. Mer.  $\frac{6}{23}$ .

27. The forenoon grey cloudy Weather, and small Gales at N N E, Mercury  $30 \frac{7}{5}$ . The Afternoon and all night close Weather with drizzling Rains, the Breeze veering to E N E.

28. Grey cloudy Weather, with some drizzling Rain, and small Northerly Gales, Mercury at  $30 \frac{7}{5}$ .

29. In the morning somewhat fair, then overcast with drizzling Rains and close Weather all day and night, small Gales from N N E. to N E, Mer.  $30 \frac{6}{5}$ .

30. A grey cloudy morning, with Gales at E N E, Mercury  $30 \frac{7}{5}$ . All Day the aforesaid weather.

31. In the morning fair and pleasant, with small Gales at S E Mer.  $30 \frac{5}{5}$ . In the forenoon overcast, Mercury falling to  $30 \frac{3}{5}$ . The afternoon and night close, thick foggy Weather, with some drizzling Rain and calm.

### JANUARY, 1701.

1. Dry Weather, somewhat close, with small Gales at S E, Mercury  $30 \frac{1}{5}$ . The Afternoon overcast and close Weather, with small Gales at



- at E S E, *Mercury* falling to  $29 \frac{1}{2}$ , and much Rain in the night.
2. Close Weather, and drizzling Rains, with moderate Gales at N N E *Mercury*  $30 \frac{1}{2}$ . At night blowing fresh, *Mercury* rising to  $30 \frac{1}{2}$ .
3. Close and cloudy Weather, with drizzling Rain, and moderate Gales at N *Mercury*  $30 \frac{1}{2}$ .
4. A grey cloudy Morning, with moderate Gales at N E, *Mercury*  $30 \frac{1}{2}$ , Afternoon close and thick Weather, with drizzling Rains, *Mercury*  $30$ . Much Rain in the night.
5. Thick close Rainy Weather, with moderate Gales at N E, *Mercury*  $30 \frac{1}{2}$ . At night fair and cold,
6. A grey cloudy Morning, with fresh Gales at N E, *Mercury*  $30 \frac{6}{10}$ . At noon  $30 \frac{7}{10}$ , at night  $30 \frac{6}{10}$ , and some Rain.
7. Close and cloudy Weather, in the morning; *Mercury*  $30 \frac{5}{10}$ , towards noon drizzling Rains, and encreasing in the afternoon, with small Winds at N E, *Mercury*  $30 \frac{4}{10}$ .
8. Thick close and cloudy Weather, with drizzling Rains and small Gales at N E, *Mercury*  $30 \frac{2}{10}$ .
9. Close and cloudy Weather, with drizzling Rains, and small Gales at E S E, *Mercury*  $30 \frac{4}{10}$ , at night fair, *Mercury*  $30 \frac{6}{10}$ .
10. A grey cloudy Morning, with fresh Gales at N. *Mercury*  $30 \frac{7}{10}$ . in the Evening and all Night rainy Weather.
11. A close and cloudy Morning, with drizzling Rains and small Gales at N. *Mercury*  $30 \frac{5}{10}$ . All Day the aforesaid Weather.
12. Thick close rainy Weather all day and night, with moderate Gales at N N W. *Mercury*  $30 \frac{2}{10}$ , much Rain at night.
13. Very thick close rainy Weather, with fresh Gales at N W. *Mercury*  $30$ . In the night cold.
14. A sharp cold Morning, with much Snow falling and close Weather, with fresh Gales at N W. *Mercury*  $30 \frac{2}{10}$ . Continued Snowing a little all day and night following, *Mercury*  $30 \frac{2}{10}$ .
15. Fair Weather, freezing hard, with some Sun shining, and fresh Gales at N N W. and N by W. *Mercury*  $30 \frac{5}{10}$ .
16. Fair and serene Weather all Day and Night, freezing hard, with moderate Gales at N N W. *Mercury*  $30 \frac{7}{10}$ . The Sun melting the Snow.
17. Fair and serene Weather, (the Sun dissolving most of the Snow) with fresh Gales at N by W. *Mercury*  $30 \frac{9}{10}$ . At night somewhat cold, freezing hard.
18. Grey cloudy Weather, freezing hard, with moderate Gales at N by W.  $30 \frac{1}{10}$ . At night rising to  $30 \frac{1}{2}$ .
19. Grey cloudy Weather, with little Frost, and moderate Gales at N N W. *Mercury*  $30 \frac{1}{10}$ .
20. Grey cloudy Weather, somewhat close, with moderate Gales at N N W. *Mercury*  $30 \frac{2}{10}$ , freezing in the Morning, and inclining to thaw at night.
21. In the Morning somewhat serene, the rest of the Day overcast, with moderate Gales at N W. and some Thaw. *Mercury*  $29 \frac{2}{10}$ .



22. Fair and serene Weather, with small Gales at W N W. *Mercury*  $30 \frac{2}{5}$ , thawing all Day with the heat of the Sun, at night cold, but not freezing. *Mercury* as before.

23. Grey and cloudy Weather, with small Gales at S E, thawing a little, *Mercury*  $30 \frac{1}{5}$ . At night much Rain and calm, *Mercury*  $30 \frac{4}{5}$ .

24. A Fair and serene Morning, with small Gales at N N W and N. *Mercury*  $30 \frac{4}{5}$ . All Day overcast, and drizzling Rains all night.

25. Close hazy Weather, with drizzling Rain and no Wind, *Mercury*  $30 \frac{4}{5}$ . At night much Rain.

26. Very close hazy Weather, with drizzling Rains and small Breezes at S E. *Mercury*  $30 \frac{2}{5}$ . In the Afternoon falling to  $29 \frac{1}{2}$ , at night much Rain, the Wind veering to N N W. blowing sometimes in Gusts.

27. Close Weather, with drizzling Rains and moderate Gales at N W. *Mercury*  $30 \frac{2}{5}$ . In the Afternoon fair, and at night freezing.

28. Grey cloudy Weather, freezing hard all Day, with moderate Gales at N W to N, *Mercury*  $30 \frac{4}{5}$ . This Day, being New Moon, began the Chinese New Year.

29. Fair and serene frosty Weather, with moderate Gales at N by W. *Mercury*  $30 \frac{6}{5}$ .

30. The Morning fair and serene, all day overcast with moderate Gales at N to N W. *Mercury*  $30 \frac{7}{5}$ . Frosty Weather.

31. Fair and serene Weather, freezing hard, with moderate Gales at W N W. *Mercury*  $30 \frac{7}{5}$ .

### F E B R U A R Y, 1701.

1. Fair and pleasant Weather, with small Gales from W. veering to S S E, and at night to N N W, but no Frost, *Mercury*  $30 \frac{6}{5}$ .

2. Fair and pleasant Weather in the Morning, little wind, in the Forenoon fine Gales at N W. *Mercury*  $30 \frac{8}{5}$ , at night little wind.

3. Dry weather, somewhat overcast, with small Gales at N W. *Mercury*  $30 \frac{6}{5}$ , at night little wind.

4. Dry weather, somewhat close, with small Gales at S E, *Mercury*  $30 \frac{6}{5}$ .

5. Fair and cloudy weather, with small Gales at N. W. *Mercury*  $30 \frac{4}{5}$ .

6. The Morning close and overcast, the Afternoon serene, with small Gales at N W. *Mercury*  $30 \frac{5}{5}$ .

7. Fair and cloudy weather, with small Gales at N N W. *Mercury*  $30 \frac{6}{5}$ .

8. Fair weather, somewhat cloudy, with variable Breezes round the Compass, *Mercury*  $30 \frac{6}{5}$ .

9. Fair and pleasant weather, with small Breezes at S E. *Mercury*  $30 \frac{7}{5}$ . At night little Wind from N N W.

10. Cloudy weather, with moderate Gales at N by W. In the Afternoon and all night drizzling Rains, *Mercury*  $30 \frac{4}{5}$ .

11. Close weather, with drizzling Rains, and small Gales at N by W. *Mer.*  $30 \frac{1}{5}$ . All night much Rain.

12. Close



12. Close weather, with some drizzling Rains and small Gales at N by W and N. N W. *Mer.*  $30 \frac{2}{10}$ .
13. Fair and pleasant weather, with small Gales from N to S S E *Mer.*  $30 \frac{5}{10}$ .
14. Close and cloudy weather, with drizzling Rains, and small Gales at N N W. *Mer.*  $30 \frac{1}{10}$ . Afternoon and night fair, pleasant and calm, *Mer.* as before.
15. Fair and serene weather, and no Wind, *Mer.*  $30 \frac{3}{10}$ . The Afternoon overcast, with close weather, and moderate Gales at S E, and some Rain, *Mer.* 30.
16. Cloudy weather, and somewhat close, with small Gales at N N W. *Mer.*  $29 \frac{1}{10}$ . In the night fresher Gales,
17. Grey cloudy weather, with moderate Gales at N N E. *Mer.*  $30 \frac{3}{10}$ .
18. Grey cloudy weather, with moderate Gales at N. *Mer.*  $30 \frac{4}{10}$ .
19. Grey cloudy weather, with moderate Gales at N N W. *Mer.*  $30 \frac{4}{10}$ .
20. Grey cloudy weather, with small Gales at N by W. *Mer.*  $30 \frac{6}{10}$ . Very cold, with some Snow at night.
21. Grey cloudy weather, with small Gales at N, *Mer.*  $30 \frac{2}{10}$ . Some Snow this Morning, whitening the tops of the Hills, and lying all day.
22. In the Morning some Sun-shining, dissolving the Snow; all day grey, cloudy weather, and temperate with small Gales at N N W. *Mer.*  $30 \frac{8}{10}$ .
23. Dry weather, somewhat cloudy, calm in the Morning, at noon blowing fresh from N W till night, then little wind, *Mer.*  $30 \frac{6}{10}$ .
24. Fair and pleasant weather, with small Gales at S E, the Afternoon calm, at night moderate Gales from N N W. *Mer.*  $30 \frac{6}{10}$ .
25. Fair and pleasant, with moderate Gales at S S E and S E, *Mer.*  $30 \frac{6}{10}$ .
26. Grey cloudy weather, with drizzling Rains all day and night, and moderate Gales at S E, *Mer.*  $30 \frac{4}{10}$ .
27. Fair weather, clearing up with small Gales at S E.
28. Fair and pleasant weather, with small Gales at N W. In the afternoon veering to W S W, and about to S E. *Mer.*  $30 \frac{6}{10}$ .

*M A R C H, 1701.*

1. Dry weather, somewhat cloudy, with moderate Gales at S E, *Mer.*  $30 \frac{5}{10}$ .
2. The Morning fair and very serene, the afternoon overcast with small Gales at S E. *Mer.*  $30 \frac{6}{10}$ .
3. The Morning fair and serene, the afternoon overcast with moderate Gales of E S E and S E, *Merc.*  $30 \frac{8}{10}$ .
4. Grey cloudy weather, with moderate Gales at S E. At night blowing fresh from N E. *Mer.*  $30 \frac{4}{10}$ .



5. Grey cloudy weather, with some Rain, and moderate Gales at S E. at night some Thunder, Lightning and Rain, *Mer.* below 30.
6. The Morning serene and temperately warm, with small Southwardly Breezes. The Forenoon and all day overcast, in the afternoon some Rain, close hazy weather with small Gales at N by E and N. *Mer.* 30.
7. Grey cloudy weather, with small Gales at E S E, at night much Rain, *Mer.* 30.
8. Grey cloudy weather, somewhat hazy, with moderate Gales at N and N by E, *Mer.*  $30 \frac{4}{5}$ .
9. Fair and pleasant weather in the forenoon, with small Gales at S E. *Mer.*  $30 \frac{6}{10}$ . The afternoon overcast, and little wind all night. *Mer.*  $30 \frac{5}{10}$ .
10. Dry weather, somewhat close, with small Gales at S E, in the Evening some Rain, *Mer.*  $30 \frac{4}{5}$ . In the night much Wind and Rain.
11. Close and cloudy weather, with small Rains and moderate Gales at N N W. *Mer.*  $30 \frac{4}{5}$ .
12. Close and cloudy weather, with moderate Gales from S E to N E. *Mer.*  $30 \frac{4}{5}$ .
13. Grey cloudy and close weather, with some Rain and small Gales at S E. *Mer.* 30.
14. Grey cloudy and close weather, with small Gales, variable from S E to N W. *Mer.*  $30 \frac{3}{5}$ .
15. Very close hazy weather, calm all Day, *Mer.*  $29 \frac{1}{2}$ . At night small Gales at W N W with some Rain.
16. Close and cloudy weather, with small Gales from N W to N. *Mer.* 30.
17. Fair and serene weather, with small variable Gales: *Mer.*  $30 \frac{4}{5}$ .
18. In the Morning overcast, with moderate Gales at N W, presently veering to S E, with drizzling Rains all day, *Mer.*  $30 \frac{3}{5}$ , falling to  $29 \frac{1}{2}$ .
19. Grey cloudy weather, for the most part calm, *Mer.*  $29 \frac{1}{2}$ .
20. Very thick foggy weather all day, with small variable Breezes, for the most part calm, *Mer.*  $29 \frac{1}{2}$ .
21. In the Morning foggy, the rest fair and serene weather, with small Southwardly Gales, *Mer.*  $29 \frac{1}{2}$ .
22. The Morning fair and serene, the afternoon overcast with some Rain and variable Gales, *Mer.* 30.
23. Grey cloudy weather, the afternoon and all night drizzling Rains and moderate Gales at N N E, *Mer.* 30.
24. Close weather, with continu'd drizzling Rains, and at night much Rain with moderate Gales from N N E to N. and very cold, *Mer.*  $30 \frac{1}{5}$ .
25. The morning somewhat cloudy, the afternoon serene, with moderate Gales at N. *Mer.*  $30 \frac{5}{10}$ .
26. Dry weather, somewhat cloudy, with small variable Gales, *Mer.*  $30 \frac{4}{5}$ .



27. Grey cloudy weather, with small variable Gales, sometimes calm, *Mer.*  $30 \frac{2}{10}$ .
28. Close hazy weather, with some Rain and small variable Gales, sometimes calm, *Mer.*  $29 \frac{1.8}{10}$ .
29. The forenoon grey cloudy weather, the afternoon very close and hazy with much Rain, *Mer.*  $29 \frac{1.7}{10}$ . Small variable Breezes, for the most part calm.
30. Close and cloudy weather, with moderate Gales at N N E, *Mer.*  $29 \frac{1.8}{10}$ . At night rising to 30, and the Gale freshning.
31. Fair weather, somewhat cloudy, with small variable Gales, *Mer.* 30.

A P R I L, 1701.

1. The forenoon overcast, afternoon more serene, with small Southerly Gales, *Mer.*  $30 \frac{1}{10}$ .
2. Fair and pleasant weather, with small Gales at S W. *Mer.*  $30 \frac{2}{10}$ .
3. Grey cloudy weather, blowing fresh in the forenoon at N E, afternoon moderate, *Mer.*  $30 \frac{4}{10}$ .
4. Fair and serene weather, the Horizon somewhat close, with easy Gales at S. *Mer.*  $30 \frac{4}{10}$ . In the forenoon the Gale veer'd to W. and the Sky somewhat hazy.
5. Close and cloudy weather, with some drizzling Rain in the forenoon and small Gales from S to E S E. The night calm and Rainy, *Mer.* 30.
6. Close foggy weather, with drizzling Rains and calm, *Mer.*  $29 \frac{1.2}{10}$ .
7. Fair and pleasant weather, somewhat cloudy and calm. In the Evening small Gales at E to N E. All night close foggy weather, *Mer.*  $29 \frac{1.8}{10}$ .
8. Close foggy weather, with small Northerly Breezes, for the most part calm, *Mer.*  $29 \frac{1.6}{10}$ .
9. The forenoon close and cloudy, afternoon fair and pleasant, with small Gales at N. In the evening calm, *Mer.*  $29 \frac{1.6}{10}$ .
10. Fair and pleasant weather, sometimes overcast, with small Gales from S W to S. *Mer.*  $29 \frac{1.8}{10}$ .
11. Fair and pleasant weather, with small Gales from S to S E. *Mer.* 30.
12. Fair weather, sometimes overcast, with moderate Gales at N. *Mer.*  $30 \frac{2}{10}$ .
13. Dry weather, somewhat hazy, with fresh sharp westerly Gales, *Mer.*  $30 \frac{4}{10}$ . In the Evening serene and little wind, *Mer.*  $30 \frac{3}{10}$ .
14. Fair and pleasant weather, with small Gales at S E. *Mer.*  $30 \frac{2}{10}$ .
15. Fair and pleasant weather, with small Gales from S to S E. In the Evening calm, *Mer.*  $30 \frac{2}{10}$ .
16. The forenoon fair and pleasant, with moderate Gales at S E. *Mer.*  $30 \frac{2}{10}$ . In the afternoon overcast, with some Rain and small Gales at N W. *Mer.* 30.
17. The



17. The forenoon fair and pleasant, with moderate Gales at S E, *Mer.* 30  $\frac{2}{10}$ , the afternoon overcast, and the Gale refreshing at night, *Mer.* 30.
18. Fair and pleasant weather, somewhat cloudy, with small Gales at S E, *Mer.* 30.
19. Cloudy weather, with a hazy Sky, and small Gales at S E, *Mer.* 29  $\frac{1.8}{2.0}$ .
20. Dry cloudy weather, with fine Gales at S E, *Mer.* 29  $\frac{1.7}{2.0}$ .
21. Grey cloudy weather, with some Rain in the forenoon, and small Breezes at S E, for the most part calm; the afternoon fair, *Mer.* 29.
22. Close and cloudy weather, with hazy and calm, in the afternoon some Rain and small Breezes at S E, *Mer.* 29  $\frac{1.6}{2.0}$ .
23. Dry weather, somewhat foggy and cloudy, with small Gales at S E, *Mer.* 29  $\frac{1.6}{2.0}$ . In the Evening thick foggy weather.
24. Grey cloudy weather, somewhat foggy, with moderate Gales at S E, *Mer.* 29  $\frac{1.7}{2.0}$ . At night much Fogg.
25. Cloudy and foggy weather, with fine Gales at S E, *Mer.* 29  $\frac{1.5}{2.0}$ . At night much Rain, Thunder and Lightning, with little wind, *Mer.* 29  $\frac{1.4}{2.0}$ .
26. Close and cloudy weather, with small Gales at N W. *Mer.* 29  $\frac{1.6}{2.0}$ . In the afternoon somewhat hazy with small drizzling Rain.
27. The weather clearing up with easy Gales at S E. *Mer.* 29  $\frac{1.7}{2.0}$ . The afternoon overcast, and in the evening much Rain with some Thunder and Lightning, the wind veering to N W, and back to S E 29  $\frac{1.5}{2.0}$ .
28. Grey cloudy weather, with some Fogg, and small Gales from W to N W. *Mer.* 29  $\frac{1.7}{2.0}$ .
29. Close and cloudy weather, with small Gales from N W to N. *Mer.* 29  $\frac{1.7}{2.0}$ . At night some Rain.
30. Grey cloudy weather, somewhat close, with fresh Gales at N W. *Mer.* 29  $\frac{1.7}{2.0}$ .

## M A Y. 1701.

1. A fair and serene Morning, with small Breezes at W by S. *Mer.* 29  $\frac{1.8}{2.0}$ . All day and night fair and pleasant, with small Breezes at N W. *Mer.* 29  $\frac{1.9}{2.0}$ .
2. Fair and serene weather, with small Breezes at S E, and sometimes calm, *Mer.* 30. In the afternoon and all night fresh Gales.
3. The weather somewhat cloudy, with fresh Gales at S E, *Mer.* 29  $\frac{1.7}{2.0}$ . In the afternoon falling to 29  $\frac{1.4}{2.0}$ . The wind veering to W N W. Had much Rain with Thunder and Lightning all night.
4. The morning close foggy weather, almost calm, *Mer.* 29  $\frac{1.7}{2.0}$ . The afternoon clear'd up, blowing fresh from N to N E, *Mer.* 30  $\frac{1.0}{2.0}$ .
5. Fair and pleasant weather, somewhat cloudy, with moderate Gales at S E. *Mer.* 30.
6. Fair and pleasant weather, somewhat cloudy, with moderate Gales at S E, *Mer.* 29  $\frac{1.2}{2.0}$ . Towards noon little Wind. In the afternoon a fine



fine Gale at S E by E, and at night thick foggy weather, *Mercury*  $29 \frac{1}{2} \frac{8}{10}$ .

7. Grey cloudy weather, somewhat foggy, with small Gales at S E, *Mer.* below  $29 \frac{1}{2} \frac{8}{10}$ .

8. Fair and pleasant weather, somewhat foggy on the Hills, and small variable Breezes from S W to N W, *Mer.*  $29 \frac{1}{2} \frac{8}{10}$ . At night much Fog.

9. Fair and pleasant weather, with some Fog on the Hills, with small variable Breezes from S W to N W, *Mer.* 30. The afternoon serene.

10. The forenoon fair and pleasant, *Mer.* falling from  $29 \frac{1}{2} \frac{8}{10}$  to  $\frac{1}{2} \frac{7}{10}$ . The afternoon overcast with small Gales from S to S E.

11. Grey cloudy weather, with small Gales at N E, *Mer.*  $29 \frac{1}{2} \frac{7}{10}$ . In the afternoon some Rain.

12. Fair and pleasant weather, somewhat cloudy, with small Northerly Gales, *Mer.*  $29 \frac{1}{2} \frac{8}{10}$ .

13. Fair and serene weather, with small Gales at S W. sometimes calm, *Mer.* above  $29 \frac{1}{2} \frac{1}{10}$ .

14. Fair and serene weather, with small Gales, variable from W to N E, *Mer.* 30. The afternoon somewhat overcast.

15. Fair and pleasant weather, with small Gales at N E, *Mer.*  $29 \frac{1}{2} \frac{8}{10}$ . At night calm.

16. Fair and serene weather, with small Gales from N E to S E. *Mer.* falling to  $29 \frac{1}{2} \frac{7}{10}$ . In the evening overcast with some Fog.

17. The morning some fog on the Hills, all day fair and serene, with small Gales at S E, *Mer.*  $29 \frac{1}{2} \frac{8}{10}$ . At night calm.

18. The Morning somewhat close and foggy, all day fair and pleasant with fine Gales at S E, *Mer.* 30.

19. Fair and pleasant weather, with fine Gales at S E, *Mer.* 30.

20. Fair and pleasant weather, with fresh Gales at S E, the Sky somewhat hazy, *Mer.*  $29 \frac{1}{2} \frac{8}{10}$ .

21. Grey cloudy weather, with fresh Gales at S E, *Mer.* falling below  $29 \frac{1}{2} \frac{8}{10}$ . At noon some small Rain.

22. Cloudy hazy weather, with small drizzling Rains and moderate Gales at S E, *Mer.* below  $29 \frac{1}{2} \frac{7}{10}$ .

23. Close and cloudy weather, with moderate Gales at S E, *Mercury*  $29 \frac{1}{2} \frac{6}{10}$ .

24. Thick hazy weather, with continual Rain, and fresh Gales from N N E to S E, *Mer.* falling below  $29 \frac{1}{2} \frac{2}{10}$ .

25. Close and cloudy weather, with moderate Gales from E to N E. *Mer.*  $29 \frac{1}{2} \frac{3}{10}$ .

26. The forenoon thick hazy weather, and the afternoon grey cloudy weather, with small Gales at N E, *Mer.* rising above  $29 \frac{1}{2} \frac{4}{10}$ .

27. Grey cloudy weather, with moderate Gales at S E, *Mer.* above  $29 \frac{1}{2} \frac{5}{10}$ . Some Rain at night.

28. Grey cloudy weather, with the wind from S E to S S E, sometimes small Gales, and sometimes blowing fresh, *Mer.*  $29 \frac{1}{2} \frac{5}{10}$ . Rain at night.



29. Grey cloudy weather, with fine Gales at S E, and drizzling Rains, *Mer.*  $29 \frac{1}{2} \frac{5}{10}$ . At night small Gales at N E, sometimes calm with thick weather.

30. Thick foggy weather, for the most part calm, and small drizzling Rains, *Mer.*  $29 \frac{1}{2} \frac{1}{10}$ . At night small Gales at S E.

31. Grey cloudy weather, somewhat foggy, with small Gales at S E, *Mer.*  $29 \frac{1}{2} \frac{2}{10}$ . At night some Rain.

### J U N E, 1701.

1. Grey cloudy and foggy weather, with some Rain in the forenoon, and small Gales at W. *Mer.*  $29 \frac{1}{2} \frac{3}{10}$ . In the afternoon, rising to  $29 \frac{1}{2} \frac{5}{10}$ . The wind veering to N, and the weather clearing up.

2. The forenoon fair and pleasant weather and calm, *Mer.*  $29 \frac{1}{2} \frac{7}{10}$ . The afternoon overcast, with some small Rain, and small Gales at S E, *Mer.* falling below  $29 \frac{1}{2} \frac{6}{10}$ . At night some Rain.

3. All this forenoon close thick Rainy weather, with small Gales at N E, *Mer.* falling below  $29 \frac{1}{2} \frac{2}{10}$ . The afternoon dry, cloudy and calm.

4. Fair and pleasant weather, with fine fresh Gales from S E to S S E, *Mer.* above  $29 \frac{1}{2} \frac{4}{10}$ .

5. Fair and serene weather, very hot, with small Gales from W S W, to N W. *Mer.* above  $29 \frac{1}{2} \frac{5}{10}$ .

6. Fair and serene weather, with variable Gales round the Compass, *Mer.*  $29 \frac{1}{2} \frac{7}{10}$ . The afternoon somewhat cloudy, and at night calm.

7. The forenoon overcast and foggy, with small Gales at S E, and since noon drizzling Rains, *Mer.* falling to  $29 \frac{1}{2} \frac{4}{10}$ . Much Rain in the night, blowing in Gusts.

8. Close hazy weather, with drizzling Rains all day, and small variable Breezes, for the most part calm, *Mer.*  $29 \frac{1}{2} \frac{3}{10}$ . At night fair.

9. This morning clearing up, with some drops of Rain and calm, *Mer.* rising to  $29 \frac{1}{2} \frac{6}{10}$ . The afternoon overcast, and some Rain in the Evening.

10. Grey cloudy weather, somewhat foggy, with small Gales at S E, sometimes calm, *Mer.*  $29 \frac{1}{2} \frac{2}{10}$ . The afternoon and night drizzling Rains.

11. This morning cloudy and foggy, with drizzling Rains and calm, *Mer.* below  $29 \frac{1}{2} \frac{8}{10}$ . The afternoon close and foggy, with drizzling Rains and small Gales from E S E to S E, *Mer.* falling to  $29 \frac{1}{2} \frac{4}{10}$ .

12. Close foggy weather, with little Wind at S E, and sometimes calm, *Mer.*  $29 \frac{1}{2} \frac{3}{10}$ . The afternoon and all night very much Rain.

13. Close foggy weather, with much Rain in the forenoon, and drizzling in the afternoon, with small variable Breezes, sometimes calm, *Mer.*  $29 \frac{1}{2} \frac{1}{10}$ .

14. The morning close and foggy, the forenoon clear'd up, with fair and pleasant weather, and small Breezes at S W. *Mer.*  $29 \frac{1}{2} \frac{4}{10}$ . The afternoon overcast, with small Gales at S E. In the evening some vehement Thunder, with Lightning and much Rain, *Mer.* below  $29 \frac{1}{2} \frac{4}{10}$ .

15. The



15. The forenoon close foggy weather, the afternoon grey and cloudy with small Gales from S E to N E, sometimes calm, *Mer.* below  $29 \frac{1}{2} \frac{4}{5}$ .

16. The forenoon close and foggy, with some Rain; at noon cleared up with small Gales from S E. *Mer.* above  $29 \frac{1}{2} \frac{3}{5}$ . At night cloudy with some Lightning.

17. The morning very hazy and calm, the forenoon cleared up with small Gales at S E, *Mer.* above  $29 \frac{1}{2} \frac{4}{5}$ . The afternoon overcast, with the Gale veering to N by E, much Rain, Thunder and Lightning. *Mer.* as before.

18. Grey cloudy weather in the morning, and clear'd up in the afternoon, with small Gales at S E, *Mer.*  $29 \frac{1}{2} \frac{6}{5}$ . The afternoon overcast with fresh Gales continuing all night, *Mer.* as before.

19. This forenoon grey cloudy weather, sometimes clearing up, with fresh Gales at S E, *Mer.*  $29 \frac{1}{2} \frac{6}{5}$ .

20. Fair and cloudy weather, with moderate Gales at S E, *Mer.*  $29 \frac{1}{2} \frac{7}{5}$ .

21. The forenoon fair and somewhat cloudy, the afternoon serene and pleasant, with small Gales at S E, *Mer.* below  $29 \frac{1}{2} \frac{6}{5}$ .

22. The forenoon fair and pleasant, with fine Gales at S E, *Mer.* below  $29 \frac{1}{2} \frac{6}{5}$ . The afternoon grey and cloudy, with little wind.

23. Fair and pleasant weather, with small Breezes at S E, for the most part calm, with some Lightning in the night, *Mer.*  $29 \frac{1}{2} \frac{6}{5}$ .

24. Fair and pleasant weather, with small Gales at S E, sometimes calm, *Mer.*  $29 \frac{1}{2} \frac{6}{5}$ . At night overcast, and calm with some Lightning.

25. Fair and serene weather, with small Gales from S E in the forenoon, *Mer.*  $29 \frac{1}{2} \frac{6}{5}$ . The afternoon fine fresh Gales from S E to S by E, and blowing very fresh all night.

26. Fair and pleasant weather, blowing very fresh from S by E to S by W. about noon little wind, *Mer.* below  $29 \frac{1}{2} \frac{6}{5}$ . The afternoon moderate Gales at S E.

27. Fair and serene weather, with moderate Gales at S E. *Mer.* below  $29 \frac{1}{2} \frac{6}{5}$ .

28. Fair and serene weather, with moderate Gales at S E, *Mer.* as before.

29. Fair and serene weather, with fine Gales at S E, *Mer.*  $29 \frac{1}{2} \frac{4}{5}$ . The evening overcast and blowing fresh all night.

30. Cloudy weather, somewhat hazy, with fresh Gales from E S E to N E, *Mer.* below  $29 \frac{1}{2} \frac{4}{5}$ . The afternoon much Rain and blowing hard all night at S E, *Mer.*  $29 \frac{1}{2} \frac{2}{5}$ .

J U L Y. 1701.

1. Cloudy and hazy weather, with some Rain and hard Gales at S E. *Mer.*  $29 \frac{1}{2} \frac{2}{5}$ .

2. The Forenoon fair and somewhat Cloudy, the afternoon serene, with fine fresh Gales at S E, *Mer.* below  $29 \frac{1}{2} \frac{1}{5}$ . All night cloudy.

3. Dry weather, somewhat Cloudy, with fine Gales at S E, *Mercury*  $29 \frac{1}{2} \frac{4}{5}$ .



4. Fair and serene weather, with fine fresh Gales at S E, *Mer.*  $29 \frac{1}{2} \frac{4}{10}$ . The evening overcast.
5. Fair and pleasant weather, somewhat cloudy, with a small shower in the forenoon, some Thunder and easy Gales at S E, *Mer.* above  $29 \frac{1}{2} \frac{5}{10}$ . At night little wind.
6. Fair and serene weather, with small gales at S E, *Mer.*  $29 \frac{1}{2} \frac{4}{10}$ . At night little Wind.
7. Fair and pleasant weather, somewhat cloudy, with fine Gales at S E, *Mer.*  $29 \frac{1}{2} \frac{4}{10}$ .
8. The Forenoon overcast, with some Rain and Gusts of Wind at S E, the afternoon fair and pleasant, with easy Gales at S E, *Mer.* above  $29 \frac{1}{2} \frac{3}{10}$ . At night some small Rain.
9. Fair and pleasant weather, sometimes cloudy, with fine Gales at S E, *Mer.* above  $29 \frac{1}{2} \frac{3}{10}$ .
10. The morning somewhat hazy and cloudy, all day fair and serene weather, with easy Gales S E. *Mer.* below  $29 \frac{1}{2} \frac{3}{10}$ .
11. Fair and pleasant Weather, with small Gales at S E, *Mercury* below  $29 \frac{1}{2} \frac{2}{10}$ . The afternoon overcast and little Wind, *Mercury* falling to  $29 \frac{1}{2} \frac{1}{10}$ . Some Thunder and Lightning.
12. The forenoon fair and pleasant, with small Gales at S E, *Mercury* below  $29 \frac{1}{2} \frac{0}{10}$ . The afternoon overcast, with several small Showers of Rain and little Wind, all night calm.
13. Fair and pleasant weather, with some Clouds and calm, *Mer.*  $29 \frac{1}{2} \frac{2}{10}$ . Towards noon overcast, and the Wind in small Gales veering to S W, with close Rainy weather all the afternoon, in the evening dry and cloudy, with small Gales at W, *Mercury*  $29 \frac{1}{2} \frac{4}{10}$ .
14. This morning and forenoon close and cloudy Weather, with much Rain and small Gales at W. *Mercury*  $29 \frac{1}{2} \frac{4}{10}$ . The afternoon dry and cloudy, the Wind and *Mercury* as before.
15. Fair and pleasant Weather, with small Breezes from W to S W, sometimes calm, *Mercury*  $29 \frac{1}{2} \frac{5}{10}$ .
16. Dry cloudy weather, with small Gales at S E, *Mer.*  $29 \frac{1}{2} \frac{4}{10}$ .
17. Fair and pleasant weather, sometimes cloudy, with fine fresh Gales at S E by S. *Mercury* above  $29 \frac{1}{2} \frac{4}{10}$ .
18. Fair and pleasant weather, sometimes overcast, with fresh Gales at S E. At night blowing very hard, *Mercury*  $29 \frac{1}{2} \frac{6}{10}$ .
19. Fair and pleasant weather, with small Gales at S E, *Mercury*  $29 \frac{1}{2} \frac{6}{10}$ .
20. Fair and serene weather, with fine fresh Gales in the forenoon, and fine fresh Gales in the afternoon, *Mercury*  $29 \frac{1}{2} \frac{5}{10}$ . At night calm.
21. Fair and serene weather, with fine Gales at S E, *Mercury*  $29 \frac{1}{2} \frac{5}{10}$ .
22. Fair and serene weather, with fine Gales at S E, *Mercury*  $29 \frac{1}{2} \frac{5}{10}$ . At night sometimes little Wind, at other times blowing fresh.
24. Fair and serene weather, with fine Gales at S E, *Mercury*  $29 \frac{1}{2} \frac{6}{10}$ . Afternoon blowing fresh.
25. Very fair and serene Weather, with small Gales at S E, *Mercury*  $29 \frac{1}{2} \frac{7}{10}$ . At night some Lightning.
26. Grey



26. Grey cloudy weather, with small Gales at S E, at night calm and some Lightning.

27. Grey cloudy weather, with small Gales at NNW in the forenoon, and veering to N E in the afternoon, *Mercury*  $29\frac{1}{2}\frac{4}{10}$ . At evening much overcast, with Thunder and Lightning and some Rain.

28. Fair and pleasant weather, somewhat cloudy, with small variable Gales from N W to N E, *Mercury*  $29\frac{1}{2}\frac{5}{10}$ .

29. Grey cloudy Weather, with small variable Gales from N E to S W, sometimes calm, *Mercury*  $29\frac{1}{2}\frac{5}{10}$ . In the evening a small Shower of Rain, with some Thunder and Lightning.

30. Fair and serene Weather and calm, *Mercury*  $29\frac{1}{2}\frac{7}{10}$ . In the afternoon small Gales at N N W, very hot and sultry. At night little Wind, with some Thunder and Lightning.

31. Fair and pleasant Weather, sometimes cloudy, with fine Gales at S E, *Mercury*  $29\frac{1}{2}\frac{6}{10}$ . Some Thunder and Lightning in the afternoon.

### AUGUST, 1701.

1. The Morning somewhat overcast, all Day fair and pleasant, with small Gales at S E, *Mercury*  $29\frac{1}{2}\frac{6}{10}$ . The afternoon fine Gales.

2. Very fair and serene Weather, with fine Gales at S E, *Mer.*  $29\frac{1}{2}\frac{7}{10}$ .

3. Fair and serene Weather, with fine Gales at S E, *Mercury*  $29\frac{1}{2}\frac{8}{10}$ .

4. Fair and serene Weather, with fine Gales at S E *Mer.*  $29\frac{1}{2}\frac{8}{10}$ .

5. The forenoon grey cloudy Weather and calm, the afternoon serene with small Gales at S E by E, *Mercury*  $29\frac{1}{2}\frac{8}{10}$ .

6. Fair and serene Weather, with small Gales at N N W, *Mercury*  $29\frac{1}{2}\frac{9}{10}$ . The evening overcast with some Lightning.

7. Fair Weather, sometimes overcast, with fresh Gales from S to S S E, *Mercury*  $29\frac{1}{2}\frac{7}{10}$ .

8. Fair and pleasant Weather in the forenoon, and cloudy in the afternoon, with small Gales at S S E, *Mer.*  $29\frac{1}{2}\frac{6}{10}$ .

9. Fair and serene Weather, with small Gales in the forenoon, and freshening in the afternoon S E,  $29\frac{1}{2}\frac{2}{10}$ .

10. Fair and serene Weather, with small Gales from S E to E by S. *Mercury*  $29\frac{1}{2}\frac{6}{10}$ . At night calm.

11. Fair and serene Weather, calm in the forenoon, and small variable Gales in the afternoon, and Lightning at Night, *Mer.*  $29\frac{1}{2}\frac{8}{10}$ .

12. Fair and serene Weather, with small Gales at S S E, at Night calm and hazy, *Mer.*  $29\frac{1}{2}\frac{7}{10}$ .

13. Fair and serene Weather, calm in the forenoon, and small variable Breezes in the Afternoon, *Mercury*  $29\frac{1}{2}\frac{8}{10}$ .

14. Fair Weather, sometimes overcast, with small Gales at N W by W. *Mercury*  $29\frac{1}{2}\frac{5}{10}$ .

15. Fair Weather, somewhat close, and some Rain in the afternoon, with small variable Gales, *Mercury*  $29\frac{1}{2}\frac{5}{10}$ .

16. Fair



16. Fair and serene Weather, calm in the forenoon, and small variable Breezes in the afternoon, *Mercury*  $29 \frac{1}{2} \frac{5}{10}$ .

17. The Weather cloudy and overcast, with some Rain in the afternoon, and small variable Gales round the Compass, *Mercury*  $29 \frac{1}{2} \frac{6}{10}$ .

18. Grey cloudy Weather, with some Rain, and easy Gales at N E, *Mercury*  $29 \frac{1}{2} \frac{6}{10}$ . In the night very fresh Gales from N E to S E, and sometimes at N W.

19. Grey cloudy Weather, with some Rain, and fresh Gales from S E to E S E, *Mercury*  $29 \frac{1}{2} \frac{5}{10}$ .

20. Fair and pleasant Weather, with fine Gales at S E, *Mer.*  $29 \frac{1}{2} \frac{6}{10}$ .

21. Fair and pleasant, with fine Gales at S E, *Mer.*  $29 \frac{1}{2} \frac{6}{10}$ .

22. Fair and serene Weather, with small Gales at S E, *Mercury*  $29 \frac{1}{2} \frac{8}{10}$ .

23. Fair and pleasant Weather, with small Gales at S E, in the afternoon somewhat cloudy and the Gale freshning, *Mercury*  $29 \frac{1}{2} \frac{8}{10}$ . In the night blew very fresh.

24. Fair and serene Weather, with moderate Gales at S E. In the evening much overcast, and at Night much Rain with some Thunder and Lightning. The Wind at N W. *Mercury*  $29 \frac{1}{2} \frac{5}{10}$ .

25. The Morning grey and cloudy, all day fair and pleasant, with small Gales at N W, in the afternoon veering to S E, and at Night calm, *Mercury*  $29 \frac{1}{2} \frac{6}{10}$ .

26. Fair and pleasant Weather, with small Gales at S E, *Mercury*  $29 \frac{1}{2} \frac{6}{10}$ .

27. Grey cloudy Weather, with drizzling Rains this Morning and Forenoon; and fair in the Afternoon, with small variable Gales, *Mer.*  $29 \frac{1}{2} \frac{5}{10}$ .

28. Fair and pleasant Weather, with small Gales from N to N E, *Mer.*  $29 \frac{1}{2} \frac{7}{10}$ . At Night calm.

29. Fair and pleasant Weather, with small Gales at N E, *Mercury*  $29 \frac{1}{2} \frac{7}{10}$ . At Night some drizzling Rain.

30. Fair and pleasant Weather, somewhat cloudy, with easy Gales at N E, *Mercury*  $29 \frac{1}{2} \frac{6}{10}$ .

31. Grey cloudy Weather, with some Rain, and moderate Gales at N E, in the Night blowing in Gusts, *Mercury*  $29 \frac{1}{2} \frac{4}{10}$ .

#### S E P T E M B E R. 1701.

1. Fair Weather, sometimes overcast, with fresh Gales from N to N W, *Mercury*  $29 \frac{1}{2} \frac{4}{10}$ .

2. Cloudy Weather, with some Rain, and blustering Gales at N N W, *Mercury*  $29 \frac{1}{2} \frac{5}{10}$ .

3. Fair and pleasant Weather, with moderate Gales at N N W, sometimes overcast and blowing fresh; at Night little Wind, *Mercury*  $29 \frac{1}{2} \frac{6}{10}$ .

4. Fair and pleasant Weather, with small Gales from N W to N. At Night calm, *Mercury*  $29 \frac{1}{2} \frac{5}{10}$ .

5. Fair



5. Fair and pleasant Weather, with small Gales at N, *Mer.*  $29 \frac{1}{2}^{\circ}$ .
6. Fair and pleasant Weather, with small Gales at N and N by W.  
*Mercury*  $29 \frac{1}{2}^{\circ}$ .
7. Fair and pleasant Weather, with small Gales at N by W and NNW.  
*Mercury* below  $29 \frac{1}{2}^{\circ}$ .
8. Fair and pleasant Weather, with small Gales at N N W. *Mercury* below  $29 \frac{1}{2}^{\circ}$ .
9. Fair and serene Weather, with small Gales at N. *Mercury*  $29 \frac{1}{2}^{\circ}$ .
10. Fair and serene Weather, with small Gales at N, *Mercury*  $29 \frac{1}{2}^{\circ}$ .
11. Fair and serene Weather, with small Gales at S E, and at Night veering to E N E, *Mercury*  $29 \frac{1}{2}^{\circ}$ .
12. Fair and serene Weather, with small Gales at S S E, *Mer.*  $29 \frac{1}{2}^{\circ}$ .
13. The forenoon fair and pleasant, the Afternoon grey cloudy Weather, with small Gales at E S E, *Mercury* 30.
14. Grey cloudy Weather, with small Gales from E S E to E N E, sometimes calm, *Mer.* 30. In the Night variable Gales with some Rain.
15. Grey cloudy Weather, with small Gales from N E to S E by E *Mercury* 30.
16. The Morning cloudy and overcast, all Day clear'd up, with easy Gales at S E, *Mercury* 30.
17. Fair and serene Weather, with moderate Gales at S E. *Mer.* 30.
18. Fair and serene Weather, with moderate Gales at S E *Mer.* 30.
19. Fair and serene Weather, with small Gales at S E. *Mercury*  $29 \frac{1}{2}^{\circ}$ .
20. Close hazy Weather, with small Gales from N E, *Mercury*  $30 \frac{1}{2}^{\circ}$ . In the afternoon some Rain.
21. Grey cloudy Weather, with moderate Gales at N by E and NNE. *Mercury*  $30 \frac{3}{4}^{\circ}$ . In the evening little Wind.
22. Dry temperate Weather, somewhat grey and cloudy, with small Gales at N by W. *Mercury*  $30 \frac{5}{8}^{\circ}$ .
23. Fair and pleasant Weather, somewhat cloudy, with small Gales at N N W. *Mercury*  $30 \frac{4}{8}^{\circ}$ .
24. Fair and pleasant Weather, with small Gales at N N W. *Mercury*  $30 \frac{2}{8}^{\circ}$ .
25. Fair and pleasant Weather, with small Gales at N N W. *Mer.*  $30 \frac{1}{8}^{\circ}$ .
26. Fair Weather, somewhat cloudy, in the afternoon some Showers of Rain, and small Gales from N N W to N W by W, *Mer.*  $30 \frac{2}{8}^{\circ}$ , rising at Night to  $30 \frac{4}{8}^{\circ}$ .
27. Fair and cloudy Weather, with small Gales from N N W to N. *Mercury*  $30 \frac{4}{8}^{\circ}$ .
28. Fair and pleasant Weather, with small Gales from N by W to N by E.
29. Dry and cloudy Weather, with small Gales at N N W.
30. Fair and pleasant Weather in the forenoon, with small Gales at N N E, the afternoon overcast with Gusts of Wind and some Showers of Rain.



OCTOBER. 1701.

1. The Morning overcast, all Day fair and pleasant, with small Gales from N N E to N.
2. The Morning grey and cloudy, all Day fair and pleasant, with small Gales at N by W.
3. Grey cloudy Weather, with moderate Gales at N and N by E, sometimes blowing fresh; at night thick and hazy with some Rain.
4. Thick hazy Weather, towards Noon clear'd up, afternoon overcast with Rain and dark Weather. Small Gales at N N E.
5. Grey cloudy Weather, with small Gales at N N E, inclining to Rain.
6. Thick hazy Weather, with much Rain and small Gales at N N E. *Mer.* below 30.
7. The Morning close and cloudy Weather, with some Rain, and small Gales at N and N by W. *Mercury* below 30. All Day thick hazy Weather, with drizzling Rains.
8. Hazy Weather, with drizzling Rains and small Gales at N N E and N E, *Mer.*  $30\frac{3}{4}$ .
9. Close hazy Weather, with drizzling Rains, and small Gales at N E, *Mer.*  $30\frac{4}{5}$ . at Night  $30\frac{5}{8}$ .
10. Close and cloudy Weather, with some Rain, and moderate Gales at N E, *Mer.*  $30\frac{5}{8}$ .
11. Grey cloudy Weather, with some Rain at Night, and small Gales at N N E, *Mercury*  $30\frac{6}{8}$ .
12. The Morning serene, with small Gales at N E, *Mer.*  $30\frac{7}{8}$ . The afternoon grey cloudy Weather, *Mer.*  $30\frac{6}{8}$ .
13. Dry cloudy Weather, with small Gales at N by E, *Mercury*  $30\frac{6}{8}$ . The afternoon more serene and almost calm.
14. Grey cloudy Weather, with moderate Gales at N E, sometimes blowing fresh, *Mercury*  $30\frac{7}{8}$ .
15. Grey cloudy Weather, inclining to Rain, with moderate Gales at N by W, *Mercury*  $30\frac{7}{8}$ . At Night much Rain.
16. Grey cloudy Weather, with some Rain at Night, and fresh Gales at N and N by W, *Mercury*  $30\frac{4}{8}$ .
17. Grey cloudy Weather, with moderate Gales at N by E, blowing fresh in the night at N N W. *Mercury*  $30\frac{4}{8}$ .
18. Fair and pleasant weather, with moderate Gales at N W by N. *Mercury*  $30\frac{5}{8}$ .
19. Fair and serene weather, with small Gales at N W. *Mer.*  $30\frac{6}{8}$ .
20. Fair and serene weather, with small Gales at W N W and W by N. *Mercury*  $30\frac{6}{8}$ .
21. Fair and serene weather, with small Gales at N E and N E by E, *Mer.*  $30\frac{6}{8}$ .

22. Fair



22. Fair and serene weather, with small Gales at N and N by E, *Mer.*  $30\frac{6}{10}$ .
23. Fair and serene weather, with small Northerly Breezes, sometimes calm, *Mercury*  $30\frac{3}{10}$ .
24. A grey cloudy Morning, blowing fresh at N N W. All Day fair and pleasant, with moderate gales at N. *Mercury*  $30\frac{5}{10}$ .
25. The forenoon overcast with fine fresh gales W N W, and sharp weather, the afternoon more serene and smaller Gales, *Mercury*  $30\frac{7}{10}$ .
26. Fair and serene weather, with fine sharp gales at N N W. *Merc.*  $30\frac{8}{10}$ .
27. Fair and serene weather, with small gales at E S E and S E, sometimes calm, *Mercury*  $30\frac{6}{10}$ .
28. Grey cloudy weather, with fresh gales at N N W and N. *Mercury*  $30\frac{8}{10}$ .
29. Fair weather, somewhat cloudy with moderate gales from N by W to N W, *Mer.*  $30\frac{8}{10}$ .
30. Grey cloudy weather, with moderate Gales at N W, *Mercury*  $30\frac{8}{10}$ .
31. Fair and serene weather, with moderate gales at N by W and N. *Mercury*  $30\frac{4}{10}$ . Very cold.

N O V E M B E R. 1701.

1. Fair and serene weather, with small gales W N W. *Mercury*  $30\frac{6}{10}$ .
2. Grey cloudy weather, with some Rain in the evening, and moderate gales at N N W. *Mercury*  $30\frac{5}{10}$ .
3. Fair and serene weather, somewhat hazy with very fresh gales at N by W and N N W, *Mercury* below  $30\frac{6}{10}$ .
4. Fair and serene weather, with small Breezes at N by E, *Mercury*  $30\frac{6}{10}$ . At night calm.
5. Fair and serene weather, with small Breezes at S E. Sometimes calm, *Mercury*  $30\frac{6}{10}$ .
6. Fair and serene weather, with small Breezes from W S W to W N W, *Mercury*  $30\frac{5}{10}$ .
7. Fair and serene weather, with small gales at N W. *Mercury*  $30\frac{6}{10}$ .
8. This Morning foggy; all day serene, with moderate gales from S W to N W, *Mercury*  $30\frac{6}{10}$ .
9. Fair and pleasant weather, sometimes overcast, with moderate gales at S E and E S E, *Mer.*  $30\frac{4}{10}$ . At night little wind and calm.
10. Fair and serene weather, with moderate gales at S E, *Mer.*  $30\frac{5}{10}$ .
11. Grey cloudy weather, with small gales at N and N by W. In the evening calm, *Mer.*  $30\frac{2}{10}$ .
12. Fair and pleasant weather, with small gales at N. In the evening calm, *Mercury*  $30\frac{4}{10}$ .
13. Fair and pleasant weather, with small gales from S by E to S E, *Mercury*  $30\frac{4}{10}$ . At night calm.



14. Grey and cloudy weather, somewhat hazy, with moderate gales from W N W to N W, *Mercury*  $30 \frac{5}{8}$ .

15. Grey cloudy weather, with fresh gales at N N E, and some small Rain, *Mer.*  $30 \frac{5}{8}$ .

16. Fair and pleasant weather, with moderate gales from S to S E, *Mer.*  $30 \frac{6}{8}$ .

17. Grey cloudy weather, with moderate gales from S by W to E S E, *Mercury*  $30 \frac{5}{8}$ . At night blowing hard and veering to N W, with much Rain.

18. Grey cloudy weather, with fresh gales at N W. In the afternoon blowing very hard, *Mercury*  $30$ .

19. Grey cloudy weather, with moderate gales at N W. *Mer.*  $30 \frac{5}{8}$ . At night rising to  $30 \frac{1}{2}$ .

20. Fair and pleasant weather, with small gales from N to E, and about to S E. In the evening little wind, *Mer.*  $30 \frac{1}{2}$ , falling to  $30 \frac{6}{8}$ .

21. Grey cloudy weather, for the most part calm, with small Northerly Breezes, *Mercury*  $30 \frac{6}{8}$ .

22. Grey cloudy weather, with moderate gales at N W. *Mer.*  $30 \frac{6}{8}$ .

23. Grey cloudy weather, with fine gales at N W. *Mer.*  $30 \frac{6}{8}$ .

24. Grey cloudy weather, with easy gales from W N W to N W. *Mercury*  $30 \frac{8}{8}$ .

25. Grey and cloudy weather, with easy gales at N W, *Mercury*  $30 \frac{6}{8}$ .

26. Fair and serene weather, with small Gales at N W, sometimes calm, *Mercury*  $30 \frac{6}{8}$ .

27. Thick hazy weather, with drizzling Rains, and at night much Rain, with small Southerly Breezes, for the most part calm, *Mer.*  $30 \frac{5}{8}$ .

28. Hazy weather, with drizzling Rains all day and night, and small gales from N to N N E, *Mer.*  $30 \frac{1}{2}$ , rising to  $30 \frac{3}{2}$ .

29. Grey cloudy weather, with small gales at N N E, *Mer.*  $30 \frac{5}{8}$ .

30. Grey cloudy weather, with fine gales at N. *Mercury*  $30 \frac{8}{8}$ .

#### D E C E M B E R. 1701.

1. Grey cloudy weather, and very cold with fine gales at N. *Mer.*  $30 \frac{1}{2}$ . Some frost at night.

2. Dry weather, somewhat cloudy, with moderate Gales at N N W, *Mercury*  $30 \frac{8}{8}$ .

3. Fair and serene weather, with small Gales at N W, *Mercury*  $30 \frac{6}{8}$ .

4. Fair and serene weather, with small gales at N W and W N W, *Mercury*  $30 \frac{6}{8}$ . At night overcast.

5. Dry cloudy weather, with moderate gales at N by W, *Mer.*  $30 \frac{2}{8}$ .

6. Fair and pleasant weather, with fine gales from E to S E, and at night calm, *Mer.*  $30 \frac{7}{8}$ , falling to  $30 \frac{5}{8}$ .

7. Grey cloudy weather, with fresh gales at N W and W N W, *Mer.*  $30 \frac{8}{8}$ .

8. Fair



8. Fair weather, somewhat cloudy, with fresh Gales at N W, Mercury  $30 \frac{1}{2}^{\circ}$ .
9. Fair and pleasant weather, with fine Gales at N N W, Mercury  $30 \frac{1}{2}^{\circ}$ .
10. Fair and serene weather, with small Gales at N W to N, Mercury  $30 \frac{1}{2}^{\circ}$ . At night calm.
11. Fair and serene weather, with small Gales at N W, Mer.  $30 \frac{1}{2}^{\circ}$ .
12. Fair and serene weather, sometimes cloudy, with small Gales at N W, Mercury  $30 \frac{2}{3}^{\circ}$ .
13. Fair and serene weather, with small Gales at N W, Mercury  $30 \frac{7}{8}^{\circ}$ . At night calm.
14. Fair and serene weather, with small Gales at N W, Mercury  $30 \frac{6}{8}^{\circ}$ . At night calm.
15. Fair and serene weather, with small Gales at S S W. Mercury  $30 \frac{8}{2}^{\circ}$ . At night the Gale freshened from S S E.
16. Grey cloudy weather, with moderate Gales at S E, Mercury  $30 \frac{6}{2}^{\circ}$ . At night some Rain.
17. Grey cloudy weather, with drizzling Rains, and small Gales at N W, Mercury  $30 \frac{5}{2}^{\circ}$ . At night calm.
18. Grey cloudy weather, with moderate Gales at N W, Mercury  $30 \frac{6}{2}^{\circ}$ . Some Sleet in the night.
19. Grey cloudy weather, with moderate Gales at N W, Mer.  $30 \frac{5}{2}^{\circ}$ .
20. Fair and serene weather, with small Gales at N W. Mercury  $30 \frac{5}{2}^{\circ}$ . At night  $30 \frac{4}{2}^{\circ}$ .
21. The forenoon somewhat hazy and calm, Mercury  $30 \frac{5}{2}^{\circ}$ . The afternoon serene, with small Gales at N W, Mercury  $30 \frac{6}{2}^{\circ}$ .
22. Fair and serene weather, freezing, with fresh Gales at N N W, Mercury  $30 \frac{1}{2}^{\circ}$ .
23. Serene weather, freezing hard, with fresh Gales at N N W. Mercury  $30 \frac{1}{2}^{\circ}$ . At night little Wind.
24. Serene weather, freezing hard, with moderate Gales at W N W. Mercury  $30 \frac{1}{2}^{\circ}$ .
25. Fair frosty weather, with moderate Gales at N W, Mer.  $30 \frac{1}{2}^{\circ}$ .
26. Fair frosty weather, with small Gales from W N W to N N W, Mercury  $30 \frac{1}{2}^{\circ}$ . At night Fog.
27. Fair and serene weather, freezing with little Wind at N N W, for the most part calm, Mercury  $30 \frac{2}{2}^{\circ}$ .
28. Fair and serene weather, freezing with small Breezes at N, and sometimes calm, Mercury  $30 \frac{8}{2}^{\circ}$ .
29. Fair and serene weather, with small Northerly Breezes, for the most part calm, Mercury  $30 \frac{6}{2}^{\circ}$ . At night some Wind and Rain.
30. The Morning foggy, all day fair and pleasant, with small Gales from S E to E by S, Mercury  $30 \frac{4}{2}^{\circ}$ .
31. Close and cloudy weather, with drizzling Rains, for the most part calm, Mercury  $30 \frac{2}{2}^{\circ}$ .



J A N U A R Y, 1702.

1. Thick hazy weather, with drizzling Rains, for the most part calm, with small variable Breezes, *Mercury*  $30 \frac{2}{5}$ .

2. Grey cloudy weather, with some Rain, and small Gales at N E, *Mercury*  $30 \frac{4}{5}$ .

3. Grey cloudy weather, with small Gales at N and N N W, *Mer.*  $30 \frac{8}{10}$ .

4. Grey cloudy weather, with small Northerly Gales, *Mer.*  $30 \frac{2}{5}$ .

5. Grey cloudy weather, with small Northerly Gales, *Mercury*  $30 \frac{4}{5}$ .  
Afternoon and night serene.

6. Fair and pleasant weather, with moderate Gales at S E. In the Evening and all Night calm, *Mercury*  $30 \frac{2}{5}$ .

7. Close and hazy weather, with small Gales at E S E and S E, sometimes calm, *Mer.*  $30 \frac{2}{5}$ .

8. Close and cloudy, in the Morning little Wind, towards noon blowing somewhat fresh at N N W, and in the Evening moderate, *Mercury*  $30 \frac{2}{5}$ , rising to  $30 \frac{4}{5}$ .

9. Grey cloudy weather, with small northerly Gales, *Mercury*  $30 \frac{4}{5}$ .

10. Grey cloudy weather, with small variable Gales, sometimes calm, *Mercury*  $30 \frac{4}{5}$ .

11. Fair and serene weather, with small Breezes at S E, *Mercury*  $30 \frac{5}{10}$ .

12. The weather overcast, with moderate Gales at W N W, *Mer.*  $30 \frac{6}{10}$ .

13. Fair and pleasant weather, with moderate Gales at N W, *Mercury*  $30 \frac{1}{5}$ .

14. Fair and serene weather, with small Gales at N, *Mercury*  $30 \frac{8}{10}$ .

15. Fair and serene weather, with small Gales at S E, *Mer.*  $30 \frac{8}{10}$ .

16. Grey cloudy weather, with small Gales from S S W to S E. The afternoon close and hazy, with some Rain, *Mercury*  $30 \frac{2}{5}$ .

17. Close hazy weather, with moderate Gales from N W to N by W, *Mercury*  $30 \frac{2}{5}$ . At night little Wind. The Chinese New Year begun this Day.

18. Close and cloudy weather and calm, *Mercury*  $30 \frac{2}{5}$ . The afternoon small drizzling Rains.

19. Grey cloudy weather, with fresh Gales at N by W, and a little Snow, *Mercury*  $30 \frac{6}{10}$ .

20. Grey cloudy weather, with small Gales at N W, the afternoon serene, and freezing hard at night, *Mer.*  $30 \frac{6}{10}$ .

21. Fair and serene Weather, freezing, with small Gales at N N W, for the most part calm, *Mercury* above  $30 \frac{6}{10}$ .

22. Fair and serene weather, freezing hard, with small Northerly Breezes, for the most part calm, *Mercury*  $30 \frac{3}{10}$ .

23. Grey cloudy weather and calm, *Mercury*  $30 \frac{4}{10}$ .

24. Close hazy weather, with drizzling Rains and calm, *Mer.*  $30 \frac{7}{10}$ .

25. Grey cloudy weather, with small Gales at N E, *Mercury*  $30 \frac{6}{10}$ .  
At night little Wind and some Rain.

26. Close



26. Close and cloudy Weather, with small Gales at N E, *Mercury*  $30 \frac{8}{10}$ . At night calm, *Mercury*  $30 \frac{2}{10}$ .
27. Thick hazy weather, with drizzling Rains and small Gales at N by E, *Mercury*  $30 \frac{1}{10}$ , blowing fresh at night.
28. Grey cloudy weather, with fresh Gales at N N W, *Mer.*  $30 \frac{6}{10}$ . At night  $30 \frac{8}{10}$ .
29. Grey cloudy weather, with fine gales at N W, *Mer.*  $30 \frac{6}{10}$ .
30. Fair and pleasant weather, with moderate gales at N W. *Mercury*  $30 \frac{7}{10}$ .
31. Fair and serene weather, with small gales at N W. *Mer.*  $30 \frac{6}{10}$ .

XIII. Last Year having been so remarkably dry, that Ponds near *Upminster*, are for the most part dry, and Springs generally very low or quite failing, I had the Curiosity to make an Extract (out of my Registers of the Weather, &c.) of the Quantity of Rain which fell at *Upminster* the last 18 Years. The Particulars of which, every Year, may be seen in the following Table. In one Column of which, the Weight of the Rain in Pounds Troy and Centesimals of Pounds, may be seen; in the other, the Depth of it in Inches and Centesimals of Inches, or what Height it would have been, had it not been imbibed by the Earth, or lessened by Exhalations, but been suffered to have stagnated on the Ground.

Among the *dry Years*, 1704 was complained of for one; which the News-Papers reported to have been so considerable at *Venice*, that they were forced to fetch their Water in Barks five Leagues off, as far as the *Brenta*; so that publick Prayers were put up for Rain. Yet we may observe that several other Years were drier than that with us at *Upminster*. But among them all, none comparable to the last Year 1714. In which the whole Quantity of Rain was no more than 55 l. 95 Hundredths, or eleven Inches nineteen hundredths; whereas the least Quantity of any of the preceeding 18 Years, exceeded 15 Inches in Depth.

What Effects this Drought hath had in the Bodies of Animals, I leave others to judge. It is well known how contagious and fatal a Distemper hath raged among not only our Black Cattle, but in many other Parts of *Europe*. And I observed the *Itch* was epidemical among the poorer sort, at the beginning of the Year; that the *Measles* were very common, some Parts of the Year; and that *Pleurisies* and *Malignant Fevers* infested a great many, especially in the Summer Months.

2. We have collected out of the *Memoirs* of the *Royal Academy of Sciences*, the Quantity of Rain and dissolved Snow which has fallen at the *Observatory* at *Paris* for 23 Years together; according to the accurate Observation of M. *De la Hire*. And that the Comparison might be made more justly, we have reduced the *French Measure* to our own. But it is to be observed, that the Diversity of Stile makes the Years not exactly the same, though, as to this Matter, the Difference may seem very inconsiderable.

*Rain at Upminster, for 18 Years, 1714. by Mr. Derham, n. 341. p. 130.*

*At Paris for 23 Years, ib. p. 132.*

Table



Table I. Of the Rain which fell at  
*Upminster*, from the Year 1697,  
to the Year 1714.

Year	Weight.		Depth.	
	l. Cent.		Inch. Cent.	
1697	77	60	15	52
1698	122	32	24	46
1699	75	54	15	11
1700	95	13	19	03
1701	93	45	18	69
1702	101	89	20	38
1703	119	94	23	99
1704	79	02	15	81
1705	84	62	16	93
1706	121	43	24	29
1707	81	55	16	31
1708	96	09	19	22
1709	132	82	26	56
1710	91	84	18	37
1711	118	02	23	60
1712	118	78	23	76
1713	115	80	23	16
1714	55	95	11	19

T A B L E II.

Anno.	French.		English.	
	Inch.	Lin.	In.	Cnt.
1689	18	11 $\frac{1}{2}$	20	23
1690	23	3 $\frac{3}{4}$	24	87
1691	14	5 $\frac{1}{4}$	15	40
1692	22	7 $\frac{1}{2}$	24	14
1693	22	8	24	18
1694	19	9	21	07
1695	19	7 $\frac{3}{4}$	20	96
1696	19	5 $\frac{1}{2}$	20	76
1697	20	3	21	60
1698	21	9	23	20
1699	18	8 $\frac{1}{4}$	19	93
1700	20	0 $\frac{1}{2}$	21	38
1701	21	4 $\frac{1}{4}$	22	78
1702	16	4	17	42
1703	17	4 $\frac{1}{4}$	18	51
1704	19	10 $\frac{1}{2}$	21	20
1705	13	10 $\frac{3}{4}$	14	82
1706	15	3 $\frac{1}{8}$	16	32
1707	17	11	19	11
1708	18	3 $\frac{1}{2}$	19	51
1709	21	9 $\frac{3}{8}$	23	21
1710	15	8 $\frac{3}{4}$	17	10
1711	25	2	26	84

Of the great  
Storm Nov.

26-27. 1703. by

Mr. Derham,

n. 289. p. 1530.

XIII. I do not think it improper to reflect as far back as *April*, *May*, *June*, and *July*; because all these were wet Months in our Southern Parts. In *April* there fell 12,49 l. of Rain thro' my Tunnel. And about 6, 7, 8 or 9 l. I esteem a moderate quantity for *Upminster*. In *May* there fell more than in any Month of any Year since the Year 1696, viz. 20,77 l. *June* likewise was a dripping Month, in which fell 14,55 l. And *July*, altho' it had considerable Intermissions, yet had 14,19 l. Above 11 l. of which fell on *July* 28th and 29th in violent Showers. And the News Papers gave accounts of great Rains that Month from divers places of *Europe*; but the *North of England* (which also escaped the violence of the late Storm) was not so remarkably wet in any of those Months; at least not in that great Proportion more than we, as usually they are, as I guess from Mr. *Towneley's* Tables of Rain. Particularly *July* was a dry Month with them, there being no more than 3,65 l. of Rain fell through Mr. *Towneley's* Tunnel of the same diameter with mine. *September* we shall find to have been a wet Month, especially the latter part of



of it; there fell of Rain in that Month 14,86 l. *October* and *November* last, although not remarkably wet, yet have been open warm Months for the most part. My Thermometer (whose freezing point is about 84) hath been very seldom below 100 all this Winter, and especially in *November*. This preceeding Disposition of the Year, particularly as to wet and warmth, I am of Opinion had a great influence in the late Storm; not only in causing a Repletion of Vapours in the Atmosphere, but also in raising such Nitro-sulphureous or other heterogeneous Matter, which when mix'd together, might make a sort of Explosion (like fired Gunpowder) in the Atmosphere. And from this Explosion I judge those Coruscations or Flashes in the Storm to have proceeded, which most People as well as myself observed, and which some took for Lightning.

The foregoing Day, viz. *Thursday, November 25*. I think deserveth regard. In the Morning of that Day was a little Rain, the Winds high in the Afternoon S by E, and S: In the Evening there was Lightning, and between 9 and 10 of the Clock at Night a violent but a short Storm of Wind and much Rain at *Upminster*, and Hail in some other Places, which did some Damage. There fell in that Storm 1,65 l. of Rain. The next Morning, which was *Friday, November 26*. the Wind was S S W. and high all Day, and so continued till I was in Bed asleep. About 12 that Night the Storm awaken'd me, which gradually encreas'd till near 3 that Morning. And from thence till near 7, it continued in the greatest Excess; and then began slowly to abate, and the *Mercury* to rise swiftly. The Barometer I found at 12 h.  $\frac{1}{2}$  P. M. at 28,72, where it continued till about 6 the next Morning, or 6 and a quarter, and then hastily rose; so that it was gotten to 82 about Eight of Clock. How the Wind fate during the late Storm I cannot positively say, it being excessively dark all the while, and my Vane blown down also. But by Information from Millers, and others that were forc'd to venture abroad, and my own Guess, I imagin it to have blown about S. W. by S. or nearer to the S. in the beginning, and to veer about towards the West towards the end of the Storm, as far as W. S. W. The degrees of the Wind's strength being not measurable (that I know of, tho' talk'd of) but by Guess, I thus determine, with respect to other Storms. On *Feb. 7. 1698*, was a terrible Storm that did much Damage. This I number 10 Degrees; the Wind then † W. N. W. Another remarkable Storm was on *February 3. 1702*, at which time was the greatest descent of *Mercury* ever known. This I number 9 Degrees. But this last of *November*, I number at least 15 Degrees.

As to *November 17th* (whereon Mr. Towneley mentions a violent Storm in *Oxfordshire*) it was a Stormy Afternoon here at *Upminster*, accompany'd with Rain, but not violent, nor *Mercury* very low. *November* the 11th and 12th had both higher Winds and more Rain; and the *Mercury* was those Days lower than even in the last Storm of *November 25*. I have accounts of the Violence of the Storm at *Normich*, *Beccles*, *Sudbury*, *Colchester*, *Rochford*, and several other intermediate Places; especially from

† *Phil. Trans.*  
n. 262. *Abr.*  
Vol. II. p. 91.



from a Clergy-man at *Lewes* in *Suffex*, of an odd Phenomenon occasioned by it, viz. "That a Phyfician travelling soon after the Storm to *Tisburyft*, about 20 Miles from *Lewes*, and as far from the Sea, as he rode he pluckt some tops of Hedges, and chewing them found them Salt. "Some Ladies of *Lewes* hearing this, tasted some Grapes that were still on the Vines, and they also had the same relish. The Grafs on the Downs in his Parish was so salt, that the Sheep in the Morning would not feed till Hunger compelled them, and afterwards drank like Fishes, as the Shepherds report. This he attributeth to Saline Particles driven from the Sea. — He heareth also, that People about *Portsmouth* were much annoyed with sulphurous Fumes, complaining they were almost suffocated therewith".

A Table, shewing the Height of the *Mercury* in the Barometer, at *Townley* and *Upminster*, before, in, and after the Storm.

<i>Townley.</i>			<i>Upminster.</i>		
Day.	Hour.	Height of <i>Mer.</i>	Day.	Hour.	Height of <i>Mer.</i>
Nov.	7	28 98	Novr.	8	29 50
25	3	64	25	12	39
	9 $\frac{1}{2}$	61		9	14
26	7	80		8	33
	3	70		12	28
	9 $\frac{1}{2}$	47	26	9	10
				12 $\frac{1}{2}$	28 72
27	7	50		7 $\frac{1}{2}$	82
	3	81	27	12	29 31
	9 $\frac{1}{2}$	95		9	42
28	7	29 34		8	65
	3	62	28	12	83
	9	84		9	30 07
29	7	88	29	8	25

A strange Effect of it in *Suffex*, by J. Fuller, Esq; *ib. p. 1530.*

2. We live ten Miles off the Sea in a direct Line, yet can scarce persuade the Country People, but the Sea Water was blown thus far, or that during the Tempest, the Rain was salt, for all the Twigs of the Trees the day after were white, and tasted very salt, as I am inform'd, tho' I tasted them not time enough my self, nor observ'd it; and that not only upon this Hill where we live facing the Sea, but in all other places within 14 or 15 Miles of the Sea, as well in the Vallies, between which and the Sea are very high Hills, as on the Hills themselves.



3. Upon the 8th of *December*, 1703. N.S. We had a dreadful Storm Observations on the same by Mr. Lewenhoeck, ib. p. 1535. from the South West, infomuch, that the Water mingled with small parts of Chalk and Stone, was so dash'd against the Glafs Windows, that many of them were darkned therewith, and the lower Windows of my House, which are made of very fine Glafs, and always kept well scower'd, and were not open'd till 8 a Clock that Morning, (notwithstanding that they look to the North East, and consequently stood from the Wind; and moreover, were guarded from the Rain by a kind of Shelf or Pent-house over them;) were yet so covered with the Particles of the Water which the Whirl-wind cast against them, that in less than half an Hour they were deprived of most of their transparency; and, forasmuch as these Particles of Water were not quite exhaled, I concluded that it must be Sea-water, which the said Storm had not only dash'd against our Windows, but spread also over the whole Country. That I might be satisfied herein, I blow'd two small Glasses, such as I thought most proper to make my Observations with, concerning the Particles of Water that adhered to my Windows. Pressing these Glasses gently against my Windows, that were covered with the suppos'd Particles of Sea water, my Glasses were tinged with a few of the said Particles.

These Glasses, with the Water I had thus collected on them, I placed about half a Foot distance from the Candle. I view'd them by my Microscope, reckoning, that by the warmth of the Candle and my Face together, the Particles of the said Water would be put into such a Motion, that they would exhale for the most part, and the Salts that were in 'em would be expos'd naked to the Sight, and so it happen'd; for in a little time a great many Salt Particles did, as it were, come out of the Water, having the Figure of our common Salt, but very small, because the Water was little, from whence those small Particles proceeded; and where the Water had lain very thin upon the Glafs, there were indeed a great number of Salt Particles, but so exceeding fine, that they almost escaped the Sight through a very good Microscope. From whence I concluded, that these Glafs windows could not be brought to their former Lustre, but by washing them with a great deal of Water; for if the Air were very clear, and the Weather dry, the watry Particles would soon exhale, but the Salts would cleave fast to the Glafs, which said Salts would be again dissolv'd in moist Weather, and sit like a Dew or Mist upon the Windows. And accordingly my People found it when they came to wash the afore-mentioned lower Windows of my House; but as to the upper Windows where the Rain had beat against them, there was little or no Salt to be found sticking upon that Glafs.

Now if we consider what a quantity of Sea-water is spread all over the Country by such a terrible Storm, and consequently how greatly impregnated the Air is with the same; we ought not to wonder, that such a quantity of Water, being moved with so great a force, should do so much Mischief to Chimneys, tops of Houses, &c. not to mention the Damages at Sea. During the Storm, and about 8 in the Morning,



I cast my Eye on the Barometer and observ'd that I had never seen the Quicksilver so low ; but half an Hour after, the Quicksilver began to rise ; tho' the Storm was not at all abated, at least to any Appearance ; whence I concluded the Storm would not last long, and so it happened.

*The History of  
the great Frost  
in 1708. by  
Mr. Derham,  
n. 324.p. 454.  
† V. sup.  
Tract. 5.*

XIV. As to the Degree of this Frost in *England*, I believe it was greater (if not more universal also) than any other within the Memory of Man. The greatest that happened within our Memory, was the *Long Frost* in 1683 ; but the late Frost, although of shorter continuance, was more intense than that ; of which I have already given some account in a former † Paper, viz. That my Thermometer was much lower on *December 30.* than it had ever been since 1697. when I first began my Thermometrical Observations ; That the self-same Thermometer in our Repository in *Gresham-College* was lower than ever it was before. [The Particulars of its greatest Descents are these ; *January 26. 1696. 41 Gr. January 5. 1683. 40 Gr. and January 3. 1708. 43 Gr.*] And lastly, that in another self-same Glass in *London* [Mr. *J. Patrick's*] the Spirits were four or five degrees lower than in 1683. In *London* the greatest Contraction of the Spirits was on *January 3.* which was an excessive cold Day at *Upminster* also : But the far greatest Contraction with us was on *December 30.* before. The Reason of the Difference is, because my Thermometer is always abroad in the open Air, where no Sun-shine toucheth ; but those two *London Glasses* are within Doors, in Rooms where no Fires are made. And it is easy to observe, that the Frost doth not presently exert its greatest force within Doors : and when it doth, neither doth it so soon abate its force within Doors, as without. These Observations of the Intenseness of the Cold with us, I have received Confirmations of from other Places in the Southern Parts of our Island ; particularly I find them to agree with some Observations made at *Streatham* in *Surrey* by Mr. *Cressener*.

The Descent of the Spirits in my Thermometer on *December 30.* was within one tenth of an Inch as great as the Descent effected at another time (and that in a cold Day too) with artificial Freezings perform'd both with Snow and Salt, and also Snow and Spirits. Both which Mixtures I have several times made use of, and find them nearly of equal Power : If any difference be, I have sometimes thought the Preference due to the Mixture of Spirit of Wine with the Snow. I said also the Contraction of the Spirits in a cold Day, because an artificial Freezing is less vigorous in a warm Day than in a cold one. It is well known that we can in Summer freeze with Ice and Salt, and the same may be then done with *Sal Armoniack* dissolv'd in Water ; but we cannot produce so intense a Frost then by these means, as in Winter, and especially in a very cold Day.



But notwithstanding the Frost was so extremely rigorous in the South-<sup>The Degree of</sup> ern part of our Isle, yet the Northern felt little thereof. My Learned <sup>the Frost in</sup> Friend Dr. *Sloane* writes to me in general; That he hath receiv'd many <sup>Scotland and</sup> Informations from those Parts, which do all agree that the Winter was <sup>Ireland.</sup> no way extremely cold there; but as other Winters. The Lord Bishop of *Carlisle*, writes thus from *Rose*, November 5. 1709. "In January  
" last I had a sufficient Occasion to take notice of the Frost and Colds  
" being more intense in the Southern Parts than here, and the Snow  
" much thicker. I began my *London*-Journey on the 26th of that Month,  
" three Days before the Thaw, and can assure you that for several  
" Miles (near the Banks of the River *Eden*, in both the Counties of  
" *Cumberland* and *Westmorland*) my Horses hardly ever trod upon Snow.  
" When we came to *Stanemoor*, on the Confines of *Torkshire*, we found  
" the Ground covered pretty thick, and the deeper still the farther we  
" came to the South. None of our Rivers or Lakes were frozen over;  
" and the extraordinary Flocks of Swans that resorted hither (nothing  
" of the like having been seen by the eldest Man living) was a sure  
" Argument that the Temperature of Climates was strangely in-  
" verted."

Sir *Robert Sibbald*, in a Letter from *Edinburgh* of the same Date, saith, "I can learn no extraordinary Effects of the cold Season here.  
" It was a long Winter, the Cold came early in *October*, and continu'd  
" till near *May*. There was much Snow, which lay long upon our  
" Hills near this Place. We had not much Frost to speak of, and it  
" lasted not long. There was but little Sport at *Curling* upon the Ice";  
[a Sport in *Scotland*, usual in hard Frosts, when the Ice can bear a great  
Company of People.]

Also in *Ireland* the Frost was very favourable: of which, among  
other Things, I hear from Mr. *Sam. Molyneux*, at *Dublin*, that, "They  
" had there an harder Winter than usual, but judgeth they suffered  
" not so much as their Neighbours: They had two or three pretty  
" hard Frosts, and some Snow, but not of any remarkable Continu-  
" ance, as he remembers."

Let us next look farther abroad, and first into the more Southerly <sup>In other Parts</sup> Parts of Europe.  
<sup>of Europe.</sup>

In the Comparison I have already given between † Dr. *Scheuchzer*'s Ob-  
servations at *Zurich* and mine here, I said, That he noted the Cold to  
have been excessive there; but whether more than usual, he saith not.  
But by a Letter I have lately seen from his Brother, it appears to have  
been in as great and unusual Excess there, as it was with us. In that  
Paper also I have said to what Excess the Frost arrived in *Italy*, viz.  
" That the Cold there was so great, that for 20 Years past they had not  
" been sensible of greater, and on *Twelfth-Day* it wanted but half a  
" Degree of the Extremity."

† V. *supr.*  
*Tract. V.*



As to the *Northern Parts*, Dr. *Woodward* tells me, That in a Letter he received from Mr. *Otho Sperling*, from *Copenhagen*, dated *April 6. 1709.* he calleth it *Hyems Atrocissima*. And I find it noted in the Minutes of the *Royal Society* of *May 4. 1709.* That Dr. *Judichar* said the Ice was 'frozen in the Harbour of *Copenhagen* 27 Inches; and that *April 9. N. S.* People had gone over between *Schonen* and *Denmark* on the Ice. In the *Northern Parts* of *Germany* also I find they had the same Fare: of which I had a printed Account put into my Hands by Dr. *Woodward*. The Title is, *Consideratio Physico-Mathematica Hyemis proxime præterlapsæ, &c.* being an Academical Exercise performed in the University of *Hall*, *June 13. 1709* by *G. Remus a Dantzicker*, and Printed at the same place [*Halæ Magdeburgicæ.*] A short account whereof may not be unacceptable.

The ingenious Author distributes the Winter into five Periods. The first of which he begins at *October 19. 1708.* at which time he saith the cold Weather began with them, the Northerly Winds then blowing, and frosty Weather accompanying it. But with us at *Upminster*, it began something sooner: For all the latter end of *September* the Winds were Northerly, and an Hoar-Frost on *Michaelmas*, and the following Days. After which, a great part of *October* to the 23d Day, my Register shews the Weather to have been for the most part Hoar frosty, or Frosty, very agreeably to Mr. *Remus's* Observations. The end of this first Period he placeth on *November 3.* the same with our *October 23. O. S.*

As to his next Period, which with its Interval takes in *November* and *December*, I find a pretty deal of Agreement between his Observations and mine, the Weather often being warm, or cold here, as it was there, and the Winds also not very different. Only I observe the Cold in one place commonly to precede the other. Also the furious Wind, that he saith blew the night before *December 13.* was not perceivable here 'till the

second Day after, viz. *December*  $\left\{ \begin{array}{l} 14 \text{ } N \text{ } S. \\ 3 \text{ } O. \text{ } S. \end{array} \right.$  about Noon: At which time

it had much spent it self, and was only a brisk Easterly Wind, but no Storm. The third Period he begins on *January 5.* of which he saith, "Scena subito mutabatur, & cum universæ Europæ admiratione cœpit

"Periodus, insolito prorsus frigore notabilis. The very same  $\left\{ \begin{array}{l} \text{Jan. 5.} \\ \text{Dec. 25.} \end{array} \right.$

the Wind and Weather began here to change, as there he saith it did, and the Cold also to encrease. The most remarkable Depressions of the Spirits he hath put into a Table, which may be seen with mine in this following little Table, fitted to our old Stile.



Day of the Month, O.S.	Degree of the Ther- mometer at Hall, at 10h. p. m.	Degree of the Ther- mometer at Up- minster, at 9h. p. m.
Dec.	27	84 $\frac{1}{2}$ 65
	28	84 $\frac{1}{2}$ 75
	29	92 $\frac{1}{2}$ 58
	30	100 45
	31	Totus in- 52
Jan.		tra Sphæ- 63
		ram. 54

For the right Understanding these Observations, it is to be observed that the Scale of their Thermometer runs downwards from some Point above, down towards the Ball. But the Ball, or bottom of the Stalk, being a certain Place that all Thermometers agree in, and every one is acquainted with, I therefore make the Degrees of the Scale of my Thermometers to begin at the top of the Ball, or (which is all one) at the bottom of the little Tube or Stalk; and so reckon upwards; every Degree being one tenth of an *English* Inch; the *Freezing Point* in my old Thermometer (here noted) at 82 gr. equal to 8 Inches, two Tenths from the Ball; and the more *Intense Cold* at 44 gr. But in my later Thermometers (which I now use, and are much nicer than my old one) the *Freezing point* is at 100 gr. ten *English* Inches from the Ball, and the most *Intense Frost* near to, or just in the Ball.

He makes the third Period to end *January* { <sup>25</sup> N. S. }  
{ <sub>14</sub> O. S. } with a westerly  
Wind, and a Thaw, which held for a few Days. With us the Wind was  
Southerly at the same time, and a Thaw accompanying it for a few Days  
likewise.

The fourth Period he begins *January*, } <sup>3<sup>d</sup></sup> N. S. } In which I observe  
  } <sub>20</sub> O. S. }

there is a great Agreement between our Observations as to the Cold; and those Days on which he noteth the westerly Winds to have been strong, it was the same here. And some Agreement also, but less, is in the Coasting and Shifting of the Winds throughout this Period.

The fifth and last Period he placeth between *Feb.* { <sup>17</sup>/<sub>6</sub> and *March* { <sup>17</sup>/<sub>6</sub>  
In this Period he saith, the cold Weather returned, and continued long: And the same it did with us. But as to the end of this Period, I find



find some Difference, and some Agreement between our Observations. The Snow was more with them than us; the Winds changed with us from the Easterly Points, to the Westerly and Southerly, a Day or two sooner than with them; then agreed with them; and soon after veered about to the Easterly and Northerly as it did with them. And I observe farther also, that when the Winds agreed in both Places, my Notes shew the Wind to have been of some force here.

As to the warmth of the Weather all this time, I find a pretty deal of Agreement; only as the Wind changed two Days sooner here, so we had the mild Weather he mentions two Days sooner: Then it grew colder here, as he saith it did with them. And whereas he noteth

April { <sup>13</sup> N S. to have been the first Day on which the Spirits rose to  
          { <sup>2</sup> O. S. the Point of Warmth, I found by my Thermometer (then renewed) the Day before to have been as warm as that, as also were the following Days; and each of them warmer than had been all the preceeding Winter; but yet that we had divers warm Days before that time, particularly March 12, 13, 14, 18, 19, 28. O. S. were warm Days, but the rest in that Month for the most part Cold.

I shall next shew what unusual *Effects* this Frost produced; and that on *Fluids, Animals, and Vegetables*.

The Effects of  
the Frost on  
Fluids.

The Waters we may easily imagine were the first thing that felt the dire Effects of this Frost. And these were in many Places frozen to an extraordinary depth; although I hardly believe to that depth, as in the Long-Frost in 1683. Of which Frost we have a sufficient instance in our River of *Thames*; whose Waters were so frozen, that above Bridge, 'tis well known, many Booths were erected, Fires made, and Meat dress'd; and on *January 10. 1683*. I my self saw a Coach and two Horses drive over the River into *Southwark*, and back again, a great number of People accompanying it. But this last Winter the Case was greatly different, according to this Account I received from Mr. *Lomthorp*; who saith, 'He saw several People cross the *Thames* at some distance above the Bridge: But that was only towards Low-water, when the great Flakes of Ice that came down, stopp'd one another at the Bridge, 'till they made one continued Bed of Ice from thence almost to the *Temple*. But when the Flood came, the Ice broke, and was all carried with the Current up the River. I was told the like happened between *Westminster* and *Lambeth*, a little above *White-hall*'. As for other Waters, they also had their share; especially where they lay exposed to the Northerly and North Easterly Winds. Nay, the Sea-waters themselves escaped not, but were covered with Ice in many Places near the Shore, in Harbours, and where they lay calm and still. Of this I have already given a pregnant Instance in the Harbour of *Copenhagen*, and the Sea between *Denmark* and *Schonen*. And in a Letter from Dr. *Newton*, Her Majesty's Envoy at *Florence*, he tells me, "The Sea was frozen both on the Coast of *Genoa* and *Leghorne*".

As



As for the Northern Parts of Germany, the last cited Dissertation gives this Account of its Effects on Fluids: *Aqua infra solitam profunditatem in glaciem abiit, & alii liquores congelati apparuere, qui alias extra congelationis periculum media hyeme constituuntur.* Pertinet hic Fons in quodam Silesiæ pago, qui cum alias æstate frigidus, hyeme calidus deprehendatur, hæc tamen hyeme spissa satis glacie non sine omnium admiratione obductus fuit. Certe Novellæ publicæ aliquoties Thermas in glaciem conversas nuntiarent: Id quod tamen calidioribus non accidit - - - - Halæ strias fontibus salsis adherentes vidimus, id quod intra seculi ambitum non contigisse fertur. Per literas me certiore reddidit D. Breynius, in urbe patria Medicus celeberrimus, Soc. Reg. Ang. Soc. &c. ipsum mare, quousque oculorum acies etiam armata penetrare poterat, adhuc die 8. Aprilis glacie tectum fuisse. Cum is Lixivium cineribus clavellatis ad saturitatem ferme imprægnatum aeri exposuisset, licet nunquam congelare ab hominibus, qui pluribus annis id tractaverant, assereretur, brevi tamen tempore in glaciem conversum esse expertus. Addit, amicum quendam suum Tartari quoque spiritum dephlegmatum congelatum observasse. Referunt observationes Halenses Sputum ex ore vix dimissum in glaciem abiens - - - - Fluvii ter in glaciem abiere, etiam illi, quibus ob celeritatem, qua feruntur, frigus aliàs non infestum.

These Effects I am apt to think the Waters felt not only in England, Denmark, Germany, France and Italy; but in all the Northern World also, excepting Scotland, Ireland, and probably some other Islands, or Places near the Sea; although even some of these appear from the foregoing Account to have been great Sufferers too. This Universality of the Frost I suspect from the Multitudes of divers kinds of Birds (utter Strangers to these Parts, and many of them Inhabitants of the Northern colder Countries) which were seen and killed in many Parts of England. In our Essex-Marshes near us, we had many wild Swans, Brent-Geese, many of the rarer Gull-kind, and divers other sorts of Birds, utter Strangers to these Parts. And Mr. Bellers gave Dr. Woodward a Catalogue of 20 Species of Birds killed within four or five Miles of Coln St. Aldwins, or Edwins, in Gloucestershire, between the beginning of November and the latter end of March 1708, which he saith are never found there in moderate Winters.

In the Dissertation before cited, we are told, how Animals suf- On Animals.  
fered both with them, and in other Places; ' That the fresh-water  
' Fish were every where killed in their Parts, and that a vast De-  
' struction befel their small Birds. Both which things he was informed  
' happened in his own Country also at Dantzick. Nay some did not,  
' saith the Author, stick to affirm, that they saw Birds, as they flew  
' along, to drop down out of the Air, their Strength failing: That the  
' Lusatia Letters said many Cows were frozen to Death in their Stalls.  
' And many Travellers on the Road, he tells us, were some quite frozen  
' to Death, others lost their Hands, Feet, Noses or Ears; and others  
' fainted, and were in great danger of Life or Limb, when brought too  
' soon near the Fire. Of these Particulars he gives divers Instances from  
their



‘ their News Papers ; of two Gentlemen, and a Smith in *England*, and  
 ‘ above 60 Men, and many Cattle near *Paris*; and the like at *Venice*, and  
 ‘ 80 *French* Soldiers near *Namur*, all killed on the Road with the Cold’.  
 Our fresh-water Fish also were many of them destroy’d in Ponds that  
 were shallow, and especially if long frozen over ; some for want of Air,  
 where the Ponds were not kept open ; and some with the cold Air at the  
 Holes in the Ice, where in great numbers they came to get Breath. On  
 the *Italian* Coast some of our poor ‘ Mariners on board our Men of War  
 ‘ died of the Cold ; and several lost parts of their Fingers and Toes :  
 As the before named Dr. *Newton* writes to me.

But the greatest Sufferers in the Animal Kingdom were *Birds* and *Insects*.  
*Robin Redbreasts*, which before the Frost were numerous, are since that  
 very scarce about us, only here and there one to be seen. Nay, notwith-  
 standing their Recruits in the following Summer, yet even still, in this  
 succeeding Winter, their scarcity remains. *Larks* also, both *Wood* and  
*Sky-Larks*, became in a manner Rarities in our Country the following  
 Spring and Summer. Neither are they as yet become so numerous as here-  
 tofore. And I have lately enquired of the *London-Poulterers* ; who tell  
 me, they have Larks from almost all Parts of *England*, and have not this  
 following Year received a Quarter, nay, scarce a Tenth part of the Larks  
 they used to have, by reason the Frost killed them, as the Bird-catchers  
 say. In the *Insect-Tribe*, I have particularly observed the *Pediculus Pul-*  
*satorius*, or *Fatidicus*, or *Death Watch*, to be great Sufferers. For few of  
 them appeared the following Summer ; and in places where they used in  
 July to be very sonorous with their Ticking Noise, only now and then  
 one was heard ; a manifest sign of their being either killed, or rendered  
 less fertile and venereous.

On Vegetables. But among all the Sufferers by the Frost, the *Vegetables* were the most  
 universal ; few of the tender Sorts escaping. About us, *Bays*, *Rosemary*,  
*Cypresses*, *Myrtles*, most of the *Phillyrea*’s, yea, even *Junipers*, among  
 Shrubs ; and *Artichokes*, *Colly-Flowers*, and a great many other  
 Olitory Plants suffered greatly. In a word, I have been informed  
 some of the *London* Gardners have lost to the Value of 80 l. 100 l. yea  
 200 l. But the most exact Account which I have met with, is from  
 Mr. *Bochart*, of the *Oxford* Physick-Garden, in a Letter to Mr. *John*  
*Thorpe*, F. R. S. in which he takes notice, That the Damages of this  
 Frost do not come up to those in 1683 ; which Frost being of longer  
 continuance, cleft the *Oaks*, and Bodies of the *Vines*, &c. But in  
 the last Frost there were Intervals of Relaxation, besides several con-  
 siderable Snows, which proved a good Guard to many Plants. But the  
 Snow melting, and the Cold withal continuing, proved of evil Con-  
 sequence to many Bulbous and Tuberous Roots, and abundance of  
 other things. ‘ But ( he saith ) the sharp, dry, and cutting Winds  
 ‘ from the North, and North-East, were most Destructive to many of the  
 ‘ Ornaments of our Gardens, which before seem’d so good natured, as to  
 ‘ be almost naturaliz’d to our Clime ; as *Cypress*, *Bays*, *Rosemary*, *Alaterni*,  
 ‘ *Phillyrea*’s,



*Phillyrea's*, *Arbuti*, *Laurustines*, &c. as also to most of our Frutescent Herbs, such as *Lavenders*, *Abrotonums*, *Rue*, *Thyme*, and divers others of such Race, especially such as had their Heads above the kind covering of the Snow: And not such Exoticks only, but some of our own Natives, as is visible in most of our *Furze-fields*, and divers *Hollies*, especially of the finer strip'd Race, have felt the smart of such the Vigour of the Season, by the loss of their Leaves, beautiful enough, and sometimes their Lives. And what (he saith) hath been more observable this Year, than in others is, The Sap of our finer mural Fruit-Trees, as of *Peaches*, *Nectarines*, *Apricocks*, &c. was so congealed and disordered, that it proved stagnated in the Limbs and Branches, and equal to Chillblains in humane Bodies; which in too many Parts of the Tree, turned to so frequent Mortifications, that it is very much to be doubted whether sufficient Vigour is ever to be expected from them, to be worth their standing, notwithstanding their weak Endeavours of shooting, and recovering of such their Maladies, seeming to make work for another Winter to compleat, what this hath so unhappily begun. And it is no less observable than extraordinary, That the very Buds in these finer Trees, as well Leaf-Buds, as Blossom-Buds (which are but the Ovaries of the succeeding Fruits) were quite killed, and dry'd into a farinaceous Matter, by the too great Sharpness of the Cold, before they grew out, though Life remained in the Branch. The *Plumbs* being more hardy, produced their Blossoms well enough; but through the chilling Wets before mentioned, which happened too plentiful about that time, and the great Defect of nutritive Warmth, they grew weak; with their little Stalks, or Pedicles languishing, and turning yellow, generally dropt off, and came to nothing. It might (he saith) reasonably have been supposed, that such conjoyn'd Cold, with repeated Wets, should have destroy'd the injurious *Insects*, which usually infest the first Product; but even this Year, they have proved vivid, in too great plenty among the *Apples* and *Pears* (especially the former) whose Blossoms, as well as Leaves, have been too copious pabulum for these voracious *Erucas*, whose Eggs lay dormant all the Winter, so dry in their Bags, that there were so many escaped from being frozen, that in many Places they proved enough to destroy the whole Verdure. *Fig-Trees* (he tells us) whose softer Texture was more easily penetrated, have suffered much, most of them being cut down, to begin the World again. Many *Exotick Greens*, and rare Plants coming from *Africa* and other warm Regions, have mightily suffered, especially in such Stoves and Conservatories as were too parsimoniously defended by Fire.

What he observeth concerning the Destruction of *Wheat*, was I believe a general Calamity in other places. 'Where the Land was poor, and coldly exposed, there the *Wheat* was kill'd; that many Lands of *Wheat* escaped tolerably well on the same warm side, when the other side was quite killed with the Extremity of the Cold'. By the warm  
 P and



and cold Sides, I suppose are meant the sunny and shady Sides. But with us the Wheat suffered rather more on the Southern, sunny Side, than the Northern; I suppose by reason the Ground was somewhat opened by the Sunshine, and the covering of Snow melted, and way thereby made to the Severity of the Nocturnal Frost. Upon which account I have heard it said by some skilful Observers, *That Vegetables suffered more the last Winter from the Sun than the Frost.* In *Essex* also about us, I observed many small Fields of three or four Acres of Wheat to escape pretty well, where fenced with thick high Hedges against the cold Winds, especially where they were covered long with Snow; at least they came off better than other Parcels of Land exposed to the Winds that dislodg'd the Snow, and aggravated the Cold also. So in the Parish where I live, the best pieces of Wheat were such I observed, as lay on gentle Descents facing the West or S. W. especially when guarded on the Eastern or N. Eastern side with a Hill or a Wood; which fenced off the cold piercing Easterly and North Easterly Winds.

And not only *Shrubs* and *Plants*, but the *larger Trees* have in some Places had their share of suffering too. But it was observed at one of the Meetings of our Society, That the Calamities which befell Trees, arose not purely from their being frozen, but principally from the Winds shaking and rocking them at the same time, which rent and parted their Fibres. The *Northerly* parts of the Island escaped better; as will appear by another part of the foremention'd Letter of *Sir Rob. Sibbald*: 'The Corn did not rise and ripen so soon as wont; but blessed be God, there hath been a plentiful Harvest, well brought into the Barns and Yards. And the Price of Victuals (which was high) falls lower daily. There was no greater number of those who died, than was usual during the Winter formerly'.

I find the Effects were, in the more Southerly Parts of *Europe*, much the same on their Vegetables as in ours. In *Italy* *Dr. Newton* saith, 'Almost all the *Lemon* and *Orange-Trees*, with those of the like kind, are destroyed in this Country by the Frost, and a great many *Olive-Trees*. The Leaves of the *Bay-Trees* have the same Colour now, as all others have when they are falling in *October*'.

There are two other Disasters he tells me of, owing probably to the Frost: One is a Disaster that happen'd at *Florence*, where 'on the side of a Hill were formerly many Buildings, which twice falling down, by the Earth giving way, a Wall was Erected in the time of the Great Duke's Grandfather, with an Inscription on the Wall, which separates the Ground from the next Street, that for the future no Person should build there. After the great Frost, this Wall hath fallen down too. The Hill is full of Stones, and they will have it, that as those increase, the Ground is pushed forward, and thereby thrown down. But I am apt to think, the Frost might have a great Concern herein. The other Accident befel at *Pisa*, where he saith, 'That upon the melting of the Snows, and the great Rains which fell after



‘ after the Frost, although the *Arno* did not swell over the Banks at  
 ‘ *Pisa*, yet the Water at some distance from the River, in a middle  
 ‘ Row of Houses, betwixt the River and the great Street on the North  
 ‘ side, with great Violence broke out, and if it had not been imme-  
 ‘ diately perceived, and the Breach stopp’d by the throwing in of a  
 ‘ great quantity of Bricks and Timber, that part of the Town  
 ‘ might have been in danger of being drowned, where the *Palace*, and  
 ‘ the *Publick Schools*, or as they call it, the *Sapienza* stand.

Dr. *Mich. Angelo Tilli*, Botanick Professor at *Pisa*, hath only told  
 me, ‘ That the Frost hath destroy’d a world of Trees both in City and  
 ‘ Country about them’. In *Switzerland*, among the high *Alpine* Ridges,  
 they felt dire Effects of the Frost, but yet some Places were so happy  
 as to escape. Of which Mr. *John Scheuchzer* says, ‘ *Effectus tristissi-*  
 ‘ *mos, quos Hyeme præterita sensere Arbores nostræ, etiam crassissimæ,*  
 ‘ *præsertim Juglandes, Vites, non prorsus sensere loca quædam præaltis*  
 ‘ *versus Septentrionem jugis munita. Vesenæ ad Rivarium-Lacum*  
 ‘ *salvæ mansere arbores & vites, ut Vindemia (apud nos nulla) ibi sit*  
 ‘ *copiosa; Juglandes fructibus oneratæ, uti quoque arbores reliquæ, ac*  
 ‘ *si in diverso succrevissent a vicinis locis Climate. Galendæ, montis*  
 ‘ *altissimi in confiniis Rhætorum & Sarunetum, radicibus adjacet pagus*  
 ‘ *Vettis. Hujus incolæ vix unquam mitiorem Hyemem habuisse testan-*  
 ‘ *tur, dum interim incolæ Pagi proximi Valentia, supra Thermas Fa-*  
 ‘ *barias siti, durante summo Frigore, aditu mutuo prorsus intercluso,*  
 ‘ *veriti fuere, ne Vettienses omnes frigore perierunt. E contra Sylvæ*  
 ‘ *Boreæ expositæ, & Arboribus etiam vivacissimis, Abietibus, Taxis,*  
 ‘ *Laricibus confitæ, quasi adustæ rufum induere colorem, foliisque nu-*  
 ‘ *data.*’ Lastly, as to the Northerly Parts of *Germany*, the Case was  
 there after the manner it was with us; which Mr. *Remus* is very curious  
 and particular in, ‘ *Arbores, saith he, & frutices ultra nivis superficiem*  
 ‘ *prominentes magno numero Frigus destruxit. Cerasus, Malus, &*  
 ‘ *Prunus risere Hyemis minas. Multa ramorum segmenta mense ad-*  
 ‘ *huc Martio Microscopio supposuit D. Præses [that is Dr. Wolfius,*  
 ‘ *Author of the Elem. Aeromet. Printed at Lipsick] nec quicquam in-*  
 ‘ *tegritati & turgescentiæ fibrarum deesse deprehendit . . . . . Flores*  
 ‘ *copiosi in Ceraso, rariores in Malo, &c. . . . . Nuces Amygdalæ, Mali*  
 ‘ *Perficæ & Mali Armeniacæ nobiliores pariter ac ignobiliore, Rosarum*  
 ‘ *frutices tantum non omnes interierunt, Pyri plurimum damni per-*  
 ‘ *pestæ. Vites sub terra defossas & satis tectas a frigoris sævitie im-*  
 ‘ *munes vidimus, at reliquas contra illud non sufficienter munitas prorsus*  
 ‘ *destructas & ipsi conspeximus, & Novellæ &c. . . . . Commemo-*  
 ‘ *randa vero sunt . . . . . quæ D. Præses annotavit. Cum statim ab*  
 ‘ *æquinoctio, nive liquefacta, & glacie resoluta, aditus in Hortos pate-*  
 ‘ *ret, Cortex, Lignum, & Medulla in iis arboribus, quibus Frigus in-*  
 ‘ *festum fuerat, e. g. in Pyro & Malo Armeniaca, nigricabant. Unde*  
 ‘ *multi . . . . . extirpabant. Cum segmenta ramorum, qui præterita*  
 ‘ *æstate adoleverant, microscopiis subjicerentur, fibrillæ hinc inde*



' disruptæ, non secus ac in ligno putrido, conspiciebantur: In reliqua  
 ' autem ramorum parte nulla istiusmodi disruptio notari poterat, suc-  
 ' cus unice desiderabatur & viriditas. Enimvero cum circa medium  
 ' Aprilis arbores calore Solis foverentur, in Malis Armeniacis ex ligno  
 ' seniore passim novæ Gemmæ erumpebant, in quibusdam etiam ex  
 ' juniore ibi proveniebant, ubi flores progerminare debuerant; in  
 ' nonnullis nullus furculus protrusus. Pyri Gemmæ omnes evolutæ, &  
 ' Flores prodire; consueto tamen vigore plerumque destituti, atque  
 ' hinc nulla Fructuum rudimenta relinquentes. Tunc temporis viridi-  
 ' tatem plenariam consequabatur Cortex, nigrior ex centro Medullæ  
 ' versus peripheriam migrabat, Ligni substantia candorem recuperabat,  
 ' Fibrillæ novi anni adhuc nigricabant, per Microscopium tamen con-  
 ' spectæ non minus ac fibrillæ eadem in Ceraso & Malo, quas frigus in-  
 ' tactas reliquerat, succo turgescere videbantur. Equidem medulla sub  
 ' Gemmis insolita nigredine passim tangebatur; radícula tamen Gem-  
 ' mæ in furculum protrusæ admodum turgida & virens oculo armato  
 ' sistebatur . . . . . Notabile vero, quod, quemadmodum Frigus Pruno,  
 ' ita etiam gemmis Malorum Armeniacarum intra corticem furculorum  
 ' Pruni immixtis pepercerit, in proceras frondes nunc excrefcentibus  
 ' juxta arbores sui generis, quibus ne unicam Gemmam intactam reli-  
 ' querat Frigus'.

Of the Causes of  
 the great Frost.

The last commended Author having ingeniously enquired into the Causes of this Frost, I shall as briefly as may be shew his Opinion. The Fountain of Heat enjoy'd by the Earth, being the Sun, and that Heat being not always the same, he enquireth into the reason why it is not so. The Variation of the mutual Distance between the Earth and the Sun at the Apogee and Perigee; the Mutation of the Earth's place in respect of the Heavens, or its being jostled at a greater distance from the Sun, and the Obstruction of the Solar Rays by the Spots on the Sun, he (after ingenious Enquiries and Calculations) rejects, and enumerates his Causes in these Words: *Ex hætenus dictis apparet, quænam ad Frigus hybernium producendum concurrere possint. Nimirum ex parte Solis requiritur ingens a vertice distantia, & exigua supra Horizonte mora: Ex parte Telluris vero, Atmosphæra exhalationibus plena, & nubibus gravida; Ventique Orientales & Septentrionales, præsertim impetuosius requiruntur. Omnium autem maxime necessarium, ut actiones Solis & diu, & tum imprimis impediuntur, quando causæ Frigoris concurrunt.* Having thus assigned his Causes, he then applies them to his five Periods, and the more remarkable Accidents that happened in them.

But after all, notwithstanding I like for the most part his Causes, as being those which are the common and ordinary ones, yet there are some other more hidden extraordinary Causes, that he hath not reached. For we have all his Causes very commonly concurring in other Winters, without the same Effects as in the last. Yea this present, next succeeding Winter 17<sup>08</sup>, we have had (besides what is common to all Winters, the Obliquity of the Sun's Rays, &c. we have had I say) the

Winds



Winds as much Northerly and Easterly, and as strong; and as much dark Weather; and all concurring together, as happen'd during the Great Frost: And yet no more than ordinary severe Weather. But as to misty, cloudy, dark Weather, which he reckons among his principal Causes, I am so far from thinking it a Cause, that I rather take it to be the reason we have not more frequent severe Frosts, at least in our Island-places, surrounded by the warm Vapours of the Sea. Clouds and Vapours do indeed intercept, and keep off the Sun-beams; and probably imbibe and retain a great deal of Warmth themselves; nay, perhaps they may (as he saith) reflect back some of the Sun-Rays; but we constantly in Winter find, that the fewer the Exhalations are, and the clearer the Air, after the Warmth of the Sun by Day, the sharper the Frost is at Night.

XV. I received the following Account of an Earthquake from the Reverend Mr. Banks Vicar of Hull.

*An Earthquake in the North of England, by Mr. Thoresby, n. 289. p. 1555.*

' December 28. 1703. Mr. Peers my Reader, was then at his Study and writing, but the heaving up of his Chair and his Desk, and the shake of his Chamber, and the rattling of his Windows, did so amaze him; that he was really affrighted, and was forc'd for a while to give over his Work. My Wife was then in her Closet, and thought her *China* would have come about her Ears, and my Family felt the Chairs moved, in which they were sitting by the Kitchen Fireside, and heard such a rattle of the Pewter and Windows, as almost affrighted them. A Gentlewoman not far off said, her Chair lifted so high, that she thought the great Dog had got under it, and to save her self from falling, slipt off her Chair. I sent to a House where part of a Chimney was shak'd down, to enquire of the Particulars; they kept Ale, and being pretty full of Company that were merry, they did not perceive the Shock, only heard the Pewter and Glass-windows dance; but the Landlady's Mother who was in a Chamber by her self, felt the shock so violent, that she verily believed the House to be coming down (as a part of the Chimney afore-mentioned did at the same Moment) and cryed out in a Fright, and had fall'n but that she catched hold of a Table. It came and went suddenly, and was attended with a Noise like the Wind, tho' there was then a perfect Calm'. It was felt in *Beverly* and other places; at *South Dalton* particularly, where the Parson's Wife being alone in her Chamber, was sadly frighted with the heaving up of her Chair she sat in, and the very sensible shake of the Room, especially the Windows, &c. A Relation of mine near *Lincoln*, being then at a Gentleman's House in the Neighbourhood, was amaz'd at the moving of the Chairs they sat upon, which was so violent, he writes every Limb of him was shaken; I am told also from a sure Hand, that at *Selby*, Mr. Travers a Minister, being in his Study writing, was interrupted much as Mr. Peers above-mentioned.



A Clergyman near *Lincoln* writes, That being about 5 in the Evening, *December* the 20th past, set with a neighbouring Minister at his House about a Mile from *Navenby*, they were surpriz'd with a sudden noise, as if it had been of two or three Coaches driven furiously down the Yard, whereupon the Servant was sent to the Door, in Expectation of some Strangers; but they quickly perceived what it was by the shaking of the Chairs they sat upon, they could perceive the very Stones move; he adds, that they were put into a greater Fright upon the Fast-day, when there was so violent a Storm, they verily thought the Church would have fallen upon them. We had also at *Leedes* a much greater Storm the Night preceeding, and a stronger Wind that Day, than when the fatal Storm was in the *South*.

*Earthquakes,  
&c. in New  
England, by  
Dr. Mather,  
n. 339. p. 69,*

XVI. Tho' Earth-quakes, have not done in *New England* the Mischiefs frequent in *Sicily, Italy, &c.* yet they have had several very sensible and affrightning. In the Year 1663. they had 6 or 7 violent shakes in the space of 3 Days: a Town lying on the River *Connecticut*, has had Scores of them in a Year, for many Years together. The *Indians* affirm, That several Rivers have not only been stopt in their course and diverted, but some wholly swallowed up by Earth-quakes. There is farther a Passage out of *Josselin*, who dwelt in the Neighbourhood, that in the Year 1670, at a Place called *Kenebunch*, near the side of the River, a piece of clay Ground was thrown up over the tops of high Oaks, growing between it and the River, which it thereby stopt, and left a hole in the Place from which it was thrown forty Yards square, &c. Next as to Storms of Hail, they have had there very extraordinary ones, insomuch that they have lain three or four Foot thick on the Ground, some as big as Hens Eggs, others five times as big. I have observ'd an Accident sometimes happening in the Winter, that it has rain'd plentifully, and at Night frozen so extremely, that the weight of the Icicles has broken the Limbs of the Trees, and not unfrequently split their Trunks. Tho' they have not those *Hurricanes* to which the *Caribbe* Islands are subject; yet they have had Whirlwinds or Gusts, drive along a particular narrow Tract, for divers Miles together, with a Violence not to be opposed by any thing on Earth; that if their Towns had stood in the way, they must undoubtedly have been destroyed. Of these, a thick dark small Cloud has arose, with a Pillar of Light in it, of about 8 or 10 Foot Diameter, and past along the Ground in a Track not wider than a Street, horribly tearing up Trees by the Roots, blowing them up in the Air like Feathers, and throwing up Stones of a great weight to a considerable height in the Air, throwing down all in its Passage; the Noise this Cloud made was so great all the while, that the Noise of the Mischiefs done by it, was thereby quite drown'd.



XVII. On the Eighth of *April*, this present Year, 1702, walking in *London Streets* about Ten in the Morning, the Air being clear, I observed the Sun to shine faintly, or as we call it waterish; whereupon casting up my Eye, I perceived several Arches of Circles about him. I made what haste I could to get on the top of a House, by the Royal-Exchange, and found the Appearance as is described in Figure 1. Plate 2. wherein.

*S* is the true Sun, *Z* the Zenith. *S T P P* a great white Circle passing through the Sun, and as near as I could judge, parallel to the Horizon. It was very distinct and entire, about two Degrees broad in the *Northern* part about *T*; and held much the same breadth in the *East* and *West*, but grew narrower towards the Sun, its edges were not very well defined, the whole appearing like a faint white Cloud, and a part of it would have been taken for such, but the whole Circle seen in the pure Azure Sky was a very surprizing Sight.

*V N X T* a Halo, or rather *Iris*, that was likewise an intire Circle, having the Sun for its Center. I measured the Semidiameter of this to be much about 22 Degrees: the breadth of this Arch, which was well defined, was by estimate equal to the Sun's Diameter, and it was coloured with the Colours of the *Iris*, but nothing near so *vivid* as in the common Rainbow. The *Reds* were next the Sun, and the *Blues* in the outward Limb. Within this Circle the Sky appeared somewhat obscure, especially near the Arch; and I take it, that the Cause of that Obscurity was likewise the Cause that the Sun shone so faint and waterish. I expected two *Parhelia* at *X* and *T* in the Intersections of this with the white Circle, having often seen them at that Distance and Position from the true Sun, but at this time none such appeared.

*P U P*. an Arch of another Circle, of which only the upper part appeared; it was in all Respects, both for Breadth and Colours like the Circle *V N X T* which it touched in the Vertical Point *V*, but its Center was below at *N*; or near it. In the Intersections of this Arch with the white Circle on both sides were two very bright *Parhelia*, so luminous, that I do not remember to have seen the like, which were also tinged with Colours, especially on the side next the Sun, where they were very red. I measured their Distance from the true Sun, and found it  $31\frac{1}{2}$  Degrees. About *V* where the two Arches were coincident, it was very bright likewise, and the *Red* on the inside very strong, that some might have imagined another Sun there also, but the *Species* thereof was drawn out so in length, that it could not properly be called a *Parhelion*: This Arch *P V P* broke off on both sides, about five or six Degrees below the *Parhelia* *P. P.* At *N*, or the lower part of the Circle *U N X T*, there appeared likewise a small piece of an Arch, which touched it there, after the same manner as *P U P* touched in *V*; it seemed to have its Center in *V*, and about *N* there appeared another longish red *Species*, such as at *V*, but not altogether so bright. The height of the Sun, during



during the Observation, was from 40 to 45 Degrees, when Clouds interposing, no more was to be seen; the Weather was cooler than ordinary, with a gentle *NW* Wind. And it was plain that the Vapour, which caused this Appearance, was higher than the Clouds, for they were seen to drive under the Circles.

Parhelia, or  
Mock Suns, by  
Dr. Mather,  
n. 339. p. 66.

XVIII. Jan. 2. 1712. At *Boston* in *New England* in a clear Sky but very cold, the Sun was, from 10 o'Clock for near 3 Hours after, attended with four *Parhelia*, in the midst whereof were three Rainbows. About 6 Weeks after, in a Day much colder than us'd to be at that Time of the Year, the Air a little hazy, a little after One o'Clock, for about  $\frac{1}{2}$  an Hour, four Mock Suns were seen. These Appearances are usually differing in some Respect from one another.

A Glade of  
Light observ'd  
in the Heavens  
by Mr. Der-  
ham, n. 305.  
p. 2220.  
Fig. 2.  
Plate 2.

XIX. As I was observing the Immersions of the 3d and 4th Satellites of *Saturn*, March 20 1706. I espy'd a very odd sort of Light in the Constellation of *Taurus*, the lower end of which was below the *Bull's* Eye, and the other a good way above it, and the Star about the middle of the lower End thereof, as in *Fig. 2.* which doth represent its Appearance to me. This Glade of Light had the same Motion the Heavens had, and was much like the Tail of a Comet, but pointed at the upper end as in the Figure. This Light, I doubt not is such as *Dr. Childrey* first observed in *England*, and which *Cassini* and others first observ'd in *France*, as *Dr. Hook* saith; I look'd for it on the 26th, and 'twas gone.

A Northern  
Streaming in  
Ireland, by  
Mr. Neve,  
commun. by  
Mr. Derham.  
n. 320. p. 309.

XX. Nov. 16. 1707. After a frosty Morning, and a fair still Day, Wind *N. W.* about  $\frac{1}{2}$  an Hour past 8 P. M. appeared a very strange Light in the North: The Evening was clear and Star-light, only the Horizon was darkned with condens'd Vapours in the North, reaching I guess 10 or 15 Degrees above the Horizon. Out of this Cloud proceeded several Streams or Rays of Light, like the Tails of some Comets, broad below, and ending in Points above. Some of them extended almost to the Tail of *Ursa Minor*, and all were nearly perpendicular to the Horizon, and it was as bright as if the Full Moon had been rising in the Cloud. But what I wondered at most, was the Motion of the dark and lighter Parts running strangely through one another in a Moment; sometimes to the *East*, and sometimes to the *West*. It continued after I saw it, about a Quarter of an Hour, often changing its Face and Appearance, as to Form and Light; sometimes broken, sometimes entire, and long Rays of Light in the clear Sky, quite separate from, and above the Cloud, and none below in the Cloud.

Of the Lumi-  
nous Appea-  
rance on the  
Wakes of

XXI. When the Ship ran apace, we often observed a great Light in the Wake of the Ship, or the Water that is broken and divided by the Ship in its Passage. Those that did not view it nearly often attributed it



it to the Moon, the Stars, or the Lanthorn at the Stern; as I did my self, when I first perceived it: But having a Window that look'd directly down upon it, I was soon undeceived; especially when I saw it appear more bright, when the Moon was under the Horizon, the Stars covered with Clouds, and no Lights in the Lanthorn, or any other Light whatsoever cast upon the Surface of the Water. This Light was not always equal; some Days it was very little, others not at all; sometimes brighter, others fainter; sometimes it was very vivid, and at other times nothing was to be seen.

As to its Brightness, perhaps you may be surprized when I tell you that I could easily read by it, tho I was 9 or 10 Foot above it from the Surface of the Water; as I did particularly *June 12*, and *July 10*. 1704. But I must inform you that I could read only the Title of my Book, which was in large Letters: Yet this seemed incredible to those I told it to; but you may believe it, and I assure you that it is a real Truth.

As to the Extent of this Light, sometimes all the Wake appeared Luminous to 30 or 40 Foot distance from the Ship; but the Light was very faint at any considerable Distance. Some Days one might easily distinguish in the Wake such Particles as were Luminous from those that were not: At other times there was no Difference. The Wake seemed then like a River of Milk, and was very pleasant to look on; as it appear'd particularly on the 10th of *July* 1704. At such times as we could distinguish the bright Parts from the others, we observed that they were not all of the same Figure: Some of 'em appear'd like Points of Light; others almost as large as Stars as they appear to the naked Eye. We saw some that looked like Globules, of a Line or two in Diameter; and others like Globes as big as ones Head. Oftentimes these *Phosphori* form'd themselves into Squares, of 3 or 4 Inches long, and one or two broad. Sometimes we could see all these different Figures at the same time; and particularly on the 12th of *June*, the Wake of the Vessel was full of large *Vortices* of Light and these oblong Squares, which I have been speaking of. Another Day, when our Ship sailed slowly; the *Vortices* appeared and disappeared again immediately like Flashes of Lightning.

Not only the Wake of a Ship produces this Light; but Fishes also in swimming leave behind 'em a luminous Tract; which is so bright that one may distinguish the Largeness of the Fish, and know of what Species it is. I have sometimes seen a great many Fishes playing in the Sea, which have made a kind of artificial Fire in the Water that was very pleasant to look on. And often only a Rope placed cross-wise will so break the Water; that it will become luminous.

If one takes some Water out of the Sea, and stirs it never so little with his Hand in the dark, he may see in it an infinite number of bright Particles. Or if one dips a piece of Linnen in Sea Water, and twists or wrings it in a dark Place, he shall see the same thing; and



if he does so, though it be half dry, yet it will produce abundance of bright Sparks. When one of the Sparkles is once formed, it remains a long time; and if it fix upon any thing that is solid, as for instance, on the side or edge of a Vessel, it will continue shining for some Hours together. It is not always that this Light appears, tho' the Sea be in great Motion; nor does it always happen when the Ship sails fastest: Neither is it the simple beating of the Waves against one another that produces this Brightness, as far as I could perceive: But I have observ'd that the beating of the Waves against the Shore, has sometimes produced it in great plenty; and on the Coast of *Brazil* the Shore was one Night so very bright, that it appeared as if it had been all on Fire.

The Production of this Light depends very much on the Quality of the Water; and if I am not deceiv'd, generally speaking, I may assert, other Circumstances being equal, that the Light is largest when the Water is fattest and fullest of Foam; for in the main Sea the Water is not every where equally pure; and sometimes if one dips Linnen into the Sea, it is clammy when it is drawn up again. And I have often observed, that when the Wake of the Ship was brightest, the Water was more fat and glutinous; and Linnen moisten'd with it produced a great deal of Light, if it were stir'd or mov'd briskly. Besides, in sailing over some Places of the Sea, we find a Matter or Substance of different Colours, sometimes red, sometimes yellow. In looking at it, one would think it was Saw-dust: Our Sailors say it is the Spawn or Seed of Whales. What it is, is not certain; but when we draw up Water in passing over these Places, it is always viscous and glutinous. Our Mariners also say, That there are a great many Heaps or Banks of this Spawn in the North; and that sometimes in the Night they appear all over of a bright Light, without being put in Motion by any Vessel or Fish passing by them. But to confirm farther what I say, *viz.* That the Water, the more glutinous it is, the more it is disposed to become luminous, I shall add one particular which I saw my self. One Day we took in our Ship a Fish, which some thought was a *Boneta*. The inside of the Mouth of the Fish appeared in the Night like a burning Coal; so that without any other Light, I could read by it the same Characters that I read by the Light in the Wake of the Ship. It's Mouth being full of a viscous Humour, we rubbed a piece of Wood with it, which immediately became all over luminous; but as soon as the Moisture was dried up, the Light was extinguish'd.

A Meteor in  
Yorkshire, by  
Mr. Thores-  
by, n. 331.  
p. 322.

XXII. On *Holy Thursday*, 1710. a flaming Sword as it was call'd, appear'd over the Town of *Leeds*, which at first I thought not worth observing, looking on it only as an hot and dry sulphurous Exhalation, the natural Effect of so great a Drought. But I have since been with some who saw it, not only in the neighbouring Towns, but a great way North, as others did about 50 Miles South, of this place. It appear'd here at a quarter past 10 at Night, and took its Course from S. to N.

It



It was broad at one end, and small at the other, and was by some thought to resemble a Trumpet, and mov'd with the broad end foremost. Having my Window Curtains drawn, I saw only a sudden Flash of Light; next day several Persons were talking of the Appearance, which was so sudden and bright, that they were startled to see their own Shadows, when neither Sun nor Moon shone on them. All Persons, tho' at many Miles distance from each other, thought it fell within 3 or 4 Furlongs of them, and that it went out with bright Sparklings at the small end. An ingenious Clergyman told me, 'twas the strangest *Deceptio Visus* he was ever sensible of, if it was not absolutely extinguish'd within a few Paces of him; yet others saw it many Miles farther North, in a few Moments. It has been likewise seen in the Counties of Nottingham and Derby, as well as York and Lancaster.

XXIII. I perceived in the Afternoon of April 3. 1707. in the Western part of the Heavens, about a quarter of an Hour after Sun-set, a long slender *Pyramidal Appearance*, perpendicular to the Horizon. The *Base* of this *Pyramid* I judged to be doubtless the Sun (then below the Horizon,) Its *Apex* reacht 15 or 20 Degrees above the Horizon. It was throughout of a rusty red Colour; and when I first saw it, pretty vivid and strong; but the top part fainter much than the bottom, nearer the Horizon. At what time this Appearance began, whether at, or how soon after Sun-set, I cannot say, being at that time in a Friend's House. But about a quarter of an Hour after Sun-set, as soon as I was gotten Abroad, I perceived it, and had for some time a fair Prospect of it, the Horizon being pretty free and open where I then was. But after a while, it grew by Degrees weaker and weaker, so that in about a quarter of an Hour after I first saw it, the top part (*a. b. d.* in Fig. 3. Pl. 2.) was scarce visible. But the lower part remained vivid much longer, but yet grew by degrees shorter and shorter. I saw the Remains of the lower half (*b. d. e. f.*) a full Hour after Sun-set; and should perhaps have seen it longer, had the Horizon been open. But it was often in my Walk pent up with Trees, which not only obstructed my Sight of the end of this unusual Appearance, but also hindred me from an exquisite Observation of all the Particulars that might probably occur.

The whole Atmosphere seemed hazy, and full of Vapours, especially towards the Sun-set. The Moon and Stars were that Evening bearded at that time, and succeeded with an *Halo* about the Moon afterwards. Which Disposition of the Air was probably the Cause of the Phenomenon. But the Pyramid was undoubtedly imprinted upon the far distant Vapours of the Atmosphere; it being manifestly farther off, or lying beyond some small thin Clouds (*c. l. c. l.*) that intercepted it, and in those parts covered and hid it. I have searched every Night since for this *Pyramis Vespertina*, but have not seen it, nor any other unusual Appearance, although the next Evening was hazy and likely.

*A Pyramidal Appearance in the Heavens at Upminster, by Mr. Derham, n. 310. p. 2411.*



An Aurora  
Borealis, by  
Dr. Halley,  
v. 347. p. 406.

XXIV. On Tuesday Mar. 6. 1716. (the Afternoon having been very serene and calm, and somewhat warmer than ordinary) about the Time it began to grow dark, that is much about 7 of the Clock, not only in London, but in all Parts of England, where the Beginning of this wonderful Sight was seen; out of what seemed a dusky Cloud, in the N.E. Parts of the Heaven, and scarce ten Degrees high, the Edges whereof were tinged with a reddish Yellow, like as if the Moon had been hid behind it, there arose very long, luminous Rays or Streaks perpendicular to the Horizon, some of which seem'd nearly to ascend to the Zenith. Presently after, that reddish Cloud was swiftly propagated along the Northern Horizon, into the N. W. and still farther Westerly; and immediately sent forth its Rays after the same manner from all Parts, now here, now there, they observing no Rule or Order in their rising. Many of these Rays seeming to concur near the Zenith, formed there a *Corona*, or Image which drew the Attention of all Spectators, who according to their several Conceptions made very different Resemblances thereof; but by which compared together, those that saw it not, may well comprehend after what manner it appeared. Some likened it to that Representation of *Glory* wherewith our Painters in Churches surround the Holy Name of God. Others to those radiating Stars wherewith the Breasts of the *Knights* of the most Noble Order of the *Garter* are adorn'd. Many compared it to the Concave of the great *Cupola* of St. Paul's Church, distinguish'd with Streaks alternately Light and Obscure, and having in the middle a Space less bright than the rest, resembling the Lantern. Whilst others, to express as well the Motion as Figure thereof, would have it to be like the Flame in an Oven, reverberated and rolling against the arched Roof thereof: And some there were that thought it liker to that tremulous Light which is cast against a Ceiling by the Beams of the Sun, reflected from the Surface of Water in a Basin that's a little shaken, whose reciprocal vibrating Motion it very much imitated. But all agree that this *Spectrum* lasted only a few Minutes, and shew'd it self variously tinged with Colours, Yellow, Red and a dusky Green. Nor did it keep in the same Place; for when first it began to appear, it was seen a little to the Northwards of the Zenith, but by Degrees declining towards the South, the long *Stria* of Light, which arose from all Parts of the Northern Semicircle of the Horizon, seemed to meet together, not much above the Head of *Castor* or the Northern *Twin*, and there soon disappeared.

After the first *Impetus* of this ascending Vapour was over, the *Corona* we have been describing appeared no more; but still, without any order as to Time, or Place, or Size, luminous *Radii* like the former continued to arise perpendicularly, now oftner and again seldomer, now here, now there, now longer, now shorter. Nor did they proceed as at first out of a Cloud, but oftner would emerge at once out of the pure Sky, which was at that time more than ordinary serene and still. Nor were they



they all of the same Form. Most of them seemed to end in a Point upwards; like erect Cones; others, like truncate Cones or Cylinders, so much resembled the long Tails of Comets, that at first sight they might well be taken for such. Again, some of these Rays would continue visible for several Minutes; when others, and those the much greater part, just shew'd themselves and died away. Some seem'd to have little Motion, and to stand as it were fix'd among the Stars, whilst others with a very perceptible Translation moved from East to West under the Pole, contrary to the Motion of the Heavens; by which means they would sometimes seem to run together, and at other Times to fly one another; affording thereby a surprizing Spectacle to the Beholders. After this Sight had continued about an Hour and a Half, those Beams began to rise much fewer in Number and not near so high, and by Degrees that diffused Light, which had illustrated the Northern Parts of the Hemisphere, seemed to subside, and settling on the Horizon formed the Resemblance of a very bright *Crepusculum*: That this was the State of this *Phænomenon*, in the first Hours, is abundantly confirmed by the unanimous Consent and concurring Testimony of several very worthy Persons, no ways enclined to deceive. For by the Letters we have received from almost all the extream Parts of the Kingdom, there is found very little Difference in the Description from what appeared at *London* and *Oxford*; unless that in the North of *England*, and in *Scotland*, the Light seemed somewhat stronger and brighter.

Hitherto I am forced to relate the Observations of others; wherein I fear many very material Circumstances may be omitted: and assuredly am not a little concerned I had no notice of this Matter, till between 9 and 10 o' Clock. Being then at a Friend's House, on the first Information of the thing we immediately ran to the Windows, which hapned to regard the S. and S. W. Quarter; and soon perceived, that though the Sky was very clear, yet it was tinged with a strange sort of Light; so that the smaller Stars were scarce to be seen, and much as it is when the Moon of four Days old appears after Twilight. And whilst we regarded the Heavens with Attention, we perceived a very thin Vapour to pass before us, which arose from the precise *East* part of the *Horizon*, ascending obliquely, so as to leave the *Zenith* about 15 or 20 Degrees to the Northward. But the Swiftneſs wherewith it proceeded was scarce to be believed, seeming not inferiour to that of Lightning; and exhibiting, as it past on, a sort of momentaneous *Nubecula*, which discovered it self by a very diluted and faint Whiteness; and was no sooner formed, but before the Eye could well take it, it was gone, and left no Signs behind it. Nor was this a single Appearance; but for several Minutes that we regarded it, about six or seven times in a Minute, the same was again and again repeated; these Waves of Vapour (if I may be allowed to use the Word) regularly succeeding one another, and, as we guess, at intervals very nearly equal; all of them in their Ascent producing a like transient *Nubecula*. By this Particular we were first assured, That  
the



the Vapour we saw, whatever it were, became conspicuous by its own proper Light, without help of the Sun's Beams : For these *Nubeculae* did not discover themselves in any other part of their Passage, but only between the *South-East*, and *South*, where being opposite to the Sun they were deepest immerst in the Cone of the Earth's Shadow ; nor were they visible before or after. Whereas the contrary must have happened, had they borrowed their Light from the Sun.

We then made all the haste we could to a Place where there is a free Prospect of the Northern Horizon. Being come there, not much past Ten of the Clock, we found, on the Western Side, *viz.* between the W. and N. W. the Representation of a very bright *Twilight*, contiguous to the Horizon ; out of which there arose very long Beams of Light, not exactly erect toward the *Vertex*, but something declining to the South, which ascending by a quick and undulating Motion to a considerable Height, vanished in a little time, whilst others, tho' at uncertain Intervals, supply'd their Place. But at the same time, through all the rest of the Northern Horizon, *viz.* from the North-West to the true East, there did not appear any Sign of Light to arise from, or joyn to, the Horizon ; but on the contrary, what appeared to be an exceeding black and dismal Cloud seem'd to hang over all that part of it. Yet was it no Cloud, but only the serene Sky more than ordinary pure and limpid, so that the bright Stars shone clearly in it, and particularly *Cauda Cygni* then very low in the *North* ; the great Blackness manifestly proceeding from the Neighbourhood of the Light which was collected above it. For the Light had now put on a Form quite different from all that we have hitherto described, and had fashioned it self into the Shape of two *Laminae* or Streaks, lying in a Position parallel to the Horizon, whose Edges were but ill terminated. They extended themselves from the N. by E. to the *North East*, and were each about a Degree broad ; the undermost about eight or nine Degrees high, and the other about four or five Degrees over it ; these kept their Places for a long time, and made the Sky so light, that I believe a Man might easily have read an ordinary Print by the Help thereof.

Whilst we stood astonished at this surprizing Sight, and expecting what was further to come, the Northern End of the upper *Lamina* by degrees bent downwards, and at length closed with the End of the other that was under it, so as to shut up on the Northside an intermediate Space, which still continued open to the East. Not long after this, in the said included Space, we saw a great number of small Columns or whitish Streaks to appear suddenly, erect to the Horizon, and reaching from the one *Lamina* to the other ; which instantly disappearing were too quick for the Eye, so that we could not judge whether they arose from the Under or fell from the Upper, but by their sudden Alterations they made such an Appearance, as might well be taken to resemble the Conflicts of Men in Battle. And much about the same time, to encrease our Wonder, there began on a sudden to appear, low under the Pole and  
very



very near due North, three or four lucid *Areas* like Clouds, discovering themselves, in the pure but very black Sky, by their yellowish Light. These, as they broke out at once, so after they had continued a few Minutes, disappeared as quick as if a Curtain had been drawn over them: Nor were they of any determined Figure, but both in Shape and Size might properly be compared to small Clouds illuminated by the full Moon, but brighter.

Not long after this, from above the aforesaid two *Laminae*, there arose a very great *Pyramidal* Figure, like a *Spear*, sharp at the Top, whose Sides were inclined to each other with an Angle of about four or five Degrees, and which seemed to reach up to the *Zenith* or beyond it. This was carried with an equable and not very slow Motion, from the N. E. where it arose, into the N. W. where it disappeared, still keeping in a perpendicular Situation, or very near it; and passing successively over all the Stars of the *Little Bear*, did not efface the smaller ones in the Tail, which are but of the fifth Magnitude; such was the extream Rarity and Perspicuity of the Matter whereof it consisted. This single Beam was so far remarkable above all those that for a great while before had preceeded it; or that followed it, that if the Situation thereof among the Circumpolar Stars had at the same Instant been accurately noted, for Example, at *London* and *Oxford*, whose Difference of *Longitude* is well known, we might be enabled thereby with some Certainty to pronounce, by its *diversitas Aspectus*, concerning the Distance and Height thereof; which were undoubtedly very great, tho' as yet we can no ways determine them. But as this Phenomenon found all those that are skill'd in the Observation of the Heavens unprepared, and unacquainted with what was to be expected; so it left all of them surpriz'd and astonished at the Novelty thereof. When therefore for the future any such thing shall happen, all those that are curious in Astronomical Matters, are hereby admonished and intreated to set their Clocks to the apparent Time at *London*, for Example, by allowing so many Minutes as is the Difference of Meridians; and then to note, at the end of every half Hour precisely, the exact Situation of what at that time appears remarkable in the Sky; and particularly the *Azimuths* of those very tall *Pyramids* so eminent above the rest, and therefore likely to be seen furthest: to the Intent that by comparing those Observations taken in the same Moment in distant Places, the Difference of their *Azimuths* may serve to determine how far those *Pyramids* are from us.

It being now past Eleven of the Clock, and nothing new offering it self to our View, but repeated *Phases* of the same Spectacle; we thought it no longer worth while to bear the Chill of the Night-air *sub dio*. Wherefore being returned to my House, I made haste to my upper Windows, which conveniently enough regard the N. E. Parts of Heaven, and soon found that the two *Laminae* or Streaks parallel to the Horizon, of which we have been speaking, had now wholly disappeared; and the whole Spectacle reduced it self to the Resemblance of a very bright *Crepusculum*.



*culum* settling on the Northern Horizon, so as to be brightest and highest under the Pole it self; from whence it spread both Ways, into the N. E. and N. W. Under this, in the middle thereof, there appeared a very black Space, as it were the Segment of a lesser Circle of the Sphere cut off by the Horizon. It seemed to the Eye like a dark Cloud, but was not so; for by the Telescope the small Stars appeared through it more clearly than usual, considering how low they were: and upon this as a *Basis* our *Lumen Auroriforme* rested, which was no other than a Segment of a Ring or Zone of the Sphere, intercepted between two parallel lesser Circles, cut off likewise by the Horizon; or, if you please, the Segment of a very broad *Iris*, but of one uniform Colour; viz. a Flame-colour inclining to yellow, the Center thereof being about forty Degrees below the Horizon. And above this there were seen some Rudiments of a much larger Segment, with an Interval of dark Sky between, but this was so exceeding faint and uncertain that I could make no proper estimate thereof.

I was very desirous to have seen how this Phenomenon would end, and attended it till near Three in the Morning, and the rising of the Moon: but for above two Hours together it had no manner of Change in its Appearance, nor Diminution nor Encrease of Light; only sometimes for very short Intervals, as if new Fuel had been cast on a Fire, the Light seem'd to undulate and sparkle, not unlike the rising of vaporous Smoak out of a great Blaze when agitated. But one thing I assured myself of by this Attendance and Watching, viz. that this *Iris*-like Figure did by no means owe its Origine to the Sun's Beams: for that about Three in the Morning, the Sun being in the middle between the North and East, our *Aurora* had not follow'd him, but ended in that very Point where he then was: where's in the true North, which the Sun had long past, the Light remained unchanged and in its full Lustre.

I have thought fit to annex a Figure exhibiting that particular Appearance of the two *Laminae*, which I saw at *London* between the Hours of Ten and Eleven; more especially, because I do not find, among the many Relations I have seen, any one that has taken notice of it. In this Figure *AB* is the under *Lamina*, somewhat broader and brighter than the upper *CD*: it had near its under Edge the *Lucida Lyrae*, and below its Northern Extremity, on the Left-hand, *Cauda Cygni*: and as well above and below these, as in the intermediate Space between them, and indeed all round about that Part of the Heavens, the Sky was so unusually dark and black, as if all that *exotick Light* that had shew'd it self before, had been then collected into those two Streaks. Only at *Q* between the West and Northwest and no where else, out of a Brightness adjoining to the Horizon, there arose conical Beams as *M, L, N*, after the same manner as at first.

Whilst we stood looking on, the Streak *CD* at its Northern End bent downward, and joyned with the Under *AB* at *E*, and included the

Space











Space *D C E A B*, which still kept open at the other End towards the East. And in the mean time, out of the very clear Sky, some luminous Spots, situated and figured as in the Scheme at *G, G, G, G*. presented themselves to the Eye, in Colour much like the *Lamina*. These did not shew themselves all together, but came successively, yet so as two or three of them were seen at a time; and as their coming was instantaneous, so they went away in a Moment. At the same time likewise, the several little white Columns marked *F, F, F, F*, occupied that Part of the Space between the two Streaks next to *E*, and by their sudden and very irregular Motion, and the vanishing of some whilst others at the same time emerged, gave occasion to the Conception of those that fancy'd Battles fought in the Air. Lastly, from about the middle of *CD*, there arose suddenly a Cone or Obelisk of a pale whitish Light, greater than any we had yet seen, as *H*; which moving from East to West, with a Motion sufficiently regular, was translated to *K*, in the *North-West*, and there disappeared.

That we might by the same Scheme shew the Appearance of the last Hours, after Midnight; the Reader is desired to take notice that we have made the Light at *Q*, much bigger than what appeared in the West about Ten of the Clock; so as to represent truly that other. In this Case the Point *Q* must, by the Imagination, be supposed transferred to the Intersection of the Horizon and Meridian under the Pole. And that we might the better be understood in what follows, we have made this short Recapitulation as annex'd to, and explicative of, the Scheme, which could by no means be contrived to answer the wonderful Variety this Phenomenon afforded; since even the Eye of no one single Observer was able to follow it in the Suddenness and Frequency of its Alterations.

This was the only sort of Meteor I had not as yet seen, and of which I began to despair, since it is certain it hath not happen'd to any remarkable Degree in this Part of *England* since I was born; nor is the like recorded in the *English Annals* since the Year of our Lord 1574, that is above One Hundred and Forty Years ago, in the Reign of Queen *Elizabeth*. Then, as we are told by the Historians of those Times, *Cambden* and *Stow*, Eye-witnesses of sufficient Credit, for two Nights successively, viz. on the 14th and 15th of *November* that Year, much the same wonderful Phenomena were seen, with almost all the same Circumstances as now. Nor indeed, during the Reign of that glorious Princess, was this so rare a Sight as it has been since. For we find in a Book entituled, *A Description of Meteors*, reprinted at *London* in the Year 1654, whose Author writes himself *W. F. D. D.* that the same thing, which he there calls *Burning Spears*, was seen at *London* on *January* 30. 1560; and again, by the Testimony of *Stow*, on the 7th of *October* 1564. And from foreign Authors we learn, that in the Year 1575. the same was twice repeated in *Brabant*, viz. on the 13th of *February* and 28th of *September*; and seen and described by *Cornelius Gemma*, Professor of Medicine in the University of *Lovain*, and Son of *Gemma Frisius* the Mathematician.



Mathematician. He, in a Discourse he wrote of the Prodigies of those Times, after several ill-boding Prognosticks, thus very properly describes the *Cupola* and *Corona* that he saw in the *Chasma* (as he calls it) of *February*. *Paulo post undecunque surgentibus Hastis & flammis novis flagrare cælum a Borea parte usque ad verticem videbatur: ac denique ne nihil quæ contigerunt hætenus præfiguratum antea videretur, conversa est Cæli facies, per horæ spatium, in Fritilli aleatorii speciem peregrinam; alternantibus sese cæruleo & candido, non minore vertigine motusque celeritate, quam solares radii solent, quoties ab objecto speculo regeruntur.* Here it is not a little remarkable, that all these four already mentioned fell exactly upon the same Age of the Moon, viz. about two Days after the Change.

As to the other of September 1575, these are the Words of *Gemma*. *Minus quidem horrendum, sed varia tamen magisque confusa nobis apparuit alterius Chasmatis forma, quarto Calendas Octobris subsecuti, statim ab occasu Solis. Nam in illo visi sunt arcus illustres plurimi, ex quibus Hastæ sensim eminentes, Urbesque turritæ & Acies militares. Erant hinc radio- rum excursus quaquaversum, & nubium fluctus & prælia: insectabantur invicem & fugiebant, facta in orbem conversione mirabili.* From hence 'tis manifest that this *Phænomenon* appeared in our Neighbourhood three several Times, and that with considerable Intervals, within the Compass of one Year; though our *English* Historians have not recorded the two latter; nor did *Gemma* see that of November 1574, as 'tis most likely by reason of Clouds. After this, in the Year 1580. we have the Authority of *Michael Mæstlin*, \* (himself a good Astronomer, and still more famous for having had the honour to be the great *Kepler's* Tutor in the Sciences) that at *Baknang* in the County of *Wirtemberg* in Germany, these *Chasmata*, as he likewise styles them, were seen by himself no less than seven times within the space of twelve Months. The first of these, and most considerable, fell out on the very same Day of the Month with ours, viz. on Sunday the sixth of March, and was attended with much the same Circumstances. And again, the same things were seen in a very extraordinary manner on the 9th of April and 10th of September following: but in a less Degree, on the 6th of April, 21st of September, 26th of December, and 16th of February 1581: the last of which, and that of the 21st of September must needs have been more considerable than they appeared, because the Moon being near the Full, necessarily effaced all the fainter Lights. Of all these however no one is mentioned in our Annals to have been seen in *England*, nor in any other place that I can find; such was the neglect of curious Matters in those Days.

\* M. Mæstlin.  
lib. de Cometa  
1580.

The next in order that we hear of, was that of the Year 1621, on September the 2d, *st. vet.* seen all over *France*, and well described by *Gassendus* in his *Physicks*, who gives it the Name of *Aurora Borealis*. This tho' little inferiour to what we lately saw, and appearing to the Northwards both of *Rouen* and *Paris*, is no where said to have been observed



observed in *England*, over which the Light seemed to lie. And since then for above 80 Years, we have no Account of any such Sight either from home or abroad; notwithstanding that for above half that time, these *Philosophical Transactions* have been a constant Register of all such extraordinary Occurrences. The first we find on our Books, was one of small Continuance seen in *Ireland* by Mr. Neve, † on the 16th of *Novem-† Phil. Trans.*  
*ber* 1707. And in the *Miscellanea Berolinensia* published in 1710, we<sup>n. 320. p. 310.</sup>  
 learn that in the same Year 1707, both on the 24th of *January* and 18th<sup>supra. p. 112.</sup>  
 of *February*, *st. vet.* something of this kind was seen by *M. Olaus Romer*  
 at *Copenhagen*: and again on the 23d of *February*, the same excellent  
*Astronomer* observed there such another Appearance, but much more  
 considerable; of which yet he only saw the Beginning, Clouds interpo-  
 sing. But the same was seen that Night by Mr. *Gotfried Kirch*, at  
*Berlin* above 200 Miles from *Copenhagen*, and lasted there till past Ten  
 at Night. To these add another small one of short Duration, seen near  
*London*, a little before Midnight between the ninth and tenth of *Aug-*  
*ust* 1708, by the Lord Bishop of *Hereford*; so that it seems, in little  
 more than eighteen Months this sort of Light has been seen in the Sky,  
 no less than five times; in the Years 1707 and 1708.

Hence we may reasonably conclude that the Air or Earth, or both, are  
 sometimes, tho' but seldom and with great Intervals, disposed to produce  
 this Phenomenon: for though it be probable that many times, when  
 it happens, it may not be observed, as falling out in the Day-time, or  
 in cloudy Weather, or bright Moon-shine: yet that it should be so very  
 often seen at some times, and so seldom at others, is what cannot well  
 be that way accounted for. Wherefore casting about and considering  
 what might be most probably the *Material Cause* of these Appearances;  
 what first occur'd was the Vapour of Water rarified exceedingly by  
 subterraneous Fire, and tinged with sulfureous Streams; which Vapour  
 is now generally taken by our Naturalists to be the Cause of *Earthquakes*.  
 And as Earthquakes happen with great Uncertainty, and have been  
 sometimes frequent in Places, where for many Years before and after  
 they have not been felt; so These, which we might be allowed to sup-  
 pose produced by the Eruption of the pent Vapour through the Pores of  
 the Earth, when it is not in sufficient Quantity, nor sudden enough to  
 shake its Surface, or to open it self a Passage by rending it. And as  
 these Vapours are suddenly produced by the Fall of Water upon the  
 nitro sulphurous Fires under Ground, they might well be thought to  
 get from thence a Tincture which might dispose them to shine in the  
 Night, and a Tendency contrary to that of Gravity; as we find the  
 Vapours of *Gun-Powder*, when heated in *Vacuo*, to shine in the Dark,  
 and ascend to the Top of the Receiver though exhausted: The Experi-  
 ment of which I saw very neatly performed by Mr. *J. Whiteside*, Keep-  
 er of *Ashmole's Museum* in *Oxford*.

Nor should I seek for any other Cause than this, if in some of these  
 Instances, and particularly this whereof we treat, the Appearance had



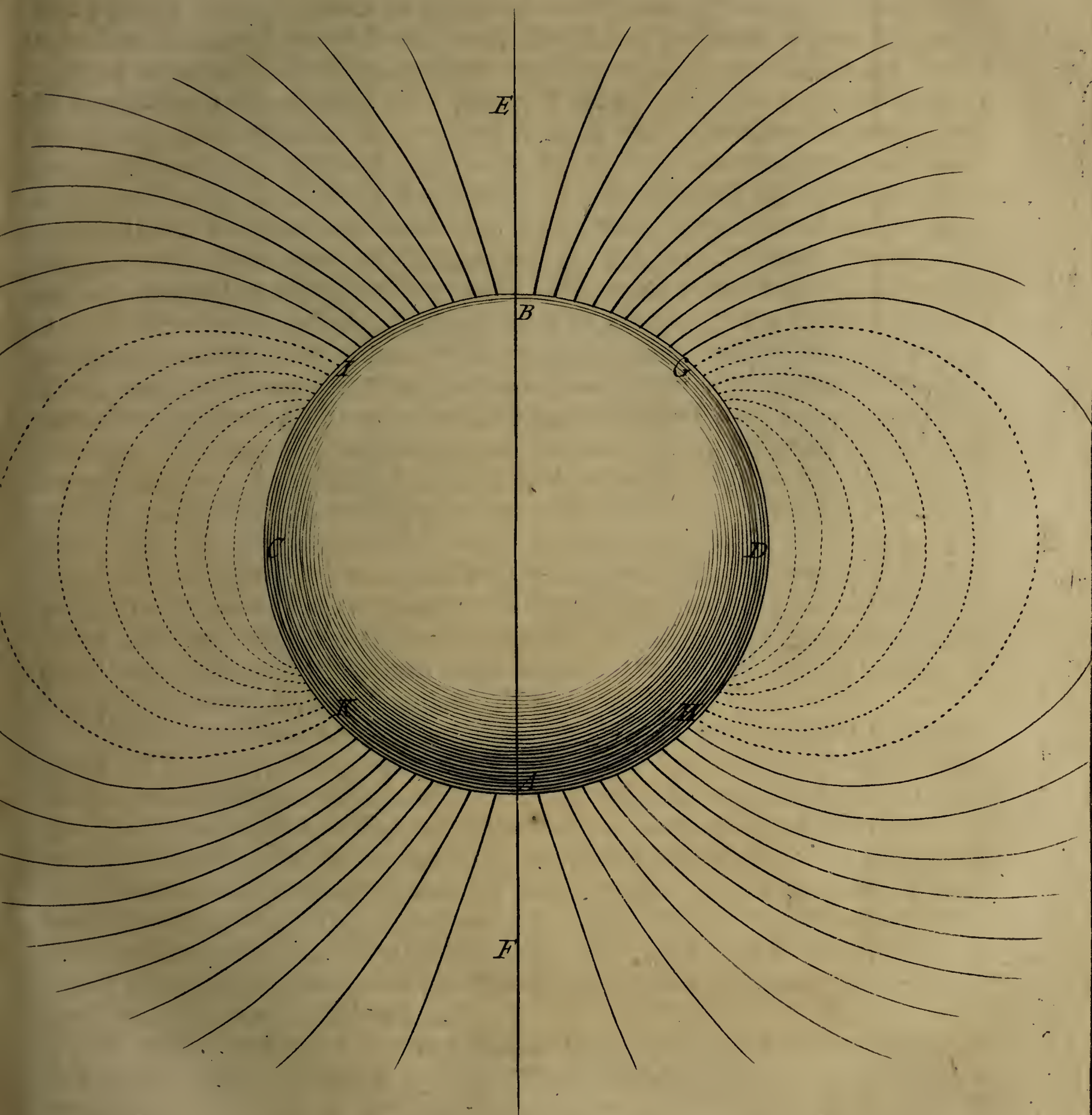
not been seen over a much greater Part of the Earth's surface than can be thus accounted for. It having in this last been visible from the West side of *Ireland* to the Confines of *Russia* and *Poland* on the East (nor do we yet know its Limits on that Side) extending over at least thirty Degrees of Longitude; and in Latitude, from about fifty Degrees over almost all the North of *Europe*; and in all Places exhibiting at the same time the same wonderful Circumstances, as we are informed by the Publick News. Now this is a Space much too wide to be shaken at any one time by the greatest of Earthquakes, or to be affected by the Perspiration of that Vapour, which being included and wanting vent, might have occasioned the Earth to tremble. Nor can we this Way account for that remarkable Particular attending these Lights, of being always seen on the Northside of the Horizon, and never to the South.

Wherefore laying aside all hopes of being able to explain these Things by the ordinary Vapours or Exhalations of the Earth or Waters, we are forced to have recourse to other sorts of *Effluvia* of a much more subtile Nature, and which perhaps may seem more adapted to bring about those wonderful and surprizingly quick Motions we have seen. Such are the *Magnetical Effluvia*, whose Atoms freely permeate the Pores of the most solid Bodies, meeting with no Obstacle from the Interposition of Glass or Marble, or even Gold it self. These by a perpetual Efflux do some of them arise from the Parts near the Poles of the Magnet, whilst others of the like kind of Atoms, but with a contrary Tendency, enter in at the same parts of the Stone, through which they freely pass; and by a kind of Circulation surround it on all Sides, as with an Atmosphere, to the Distance of some Diameters of the Body. This thing † *des Cartes* has endeavour'd to explain by the *Hypothesis* of the Circulation of certain skrewed or *striate Particles*, adapted to the Pores they are to enter.

† Princip.  
Philos.  
Lib. VI.

But without enquiring how sufficient the *Cartesian Hypothesis* may be for answering the several Phenomena of the *Magnet*: that the Fact may be the better comprehended, we shall endeavour to exhibit the manner of the Circulation of the Atoms concerned therein, as they are exposed to view by placing the Poles of a *Terrella* or *Spherical Magnet* on a Plane, as the Globe on the Horizon of a Right Sphere: Then strewing fine Steel Dust or Filings very thin on the Plain all round it, the Particles of Steel, upon a continued gentle knocking on the underside of the Plain, will by degrees conform themselves to the Figures in which the Circulation is performed. Thus in *Plate 3.* let *A B C D* be a *Terrella*; and its Poles *A* the South, and *B* the North; and by doing as prescribed, it will be found that the Filings will lie in a Right Line perpendicular to the Surface of the Ball, when in the Line of the Magnetical Axis continu'd. But for about forty five Degrees on either side, from *B* to *G* or *I*, and from *A* to *H* or *K*, they will form themselves into Curves, more and more crooked as they are remoter from the Poles; and withal more and more oblique to the Surface of the Stone: as our Figure truly represents, and as may readily be shewn by the *Terrella* and *Apparatus* for that Purpose











pose in the *Repository* of the *Royal Society*. Hence it may appear how this exceeding subtile Matter revolves; and particularly how it permeates the Magnet with more force and in greater Quantity in the circumpolar Parts, entring into it on the one side, and emerging from it on the other, under the same oblique Angles: whilst in the middle Zone about *C* and *D*, near the Magnet's Equator (if I may use the Word) very few if any of these Particles do impinge, and those very obliquely.

Now by many and very evident Arguments it appears that our *Globe* of *Earth* is no other than one great Magnet, or (if I may be allowed to alledge an Invention of my own) rather two; the one including the other as the *Shell* includes the *Kernel* (for so and not otherwise we may explain the Changes of the Variation of the Magnetical Needle) but to our present Purpose the Result is the same. It suffices that we may suppose the same sort of Circulation of such an exceeding fine Matter to be perpetually performed in the *Earth*, as we observe in the *Terrella*; which subtile Matter freely pervading the Pores of the Earth, and entring into it near its Southern Pole, may pass out again into the Ether, at the same Distance from the Northern, and with a little Force; its Direction being still more and more oblique, as the Distance from the Poles is greater. To this we beg leave to suppose, That this subtile Matter, no otherways discovering it self but by its Effects on the Magnetick Needle, wholly imperceptible and at other times invisible, may now and then, by the Concourse of several Causes very rarely coincident, and to us as yet unknown, be capable of producing a small Degree of Light; perhaps from the greater Density of the Matter, or the greater Velocity of its Motion: after the same manner as the *Effluvia* of *Electrick* Bodies by a strong and quick Friction emit Light in the Dark: to which sort of Light this seems to have a great Affinity.

This being allowed me, I think we may readily assign a Cause for many of the strange Appearances we have been treating of, and for some of the most difficult to account for otherwise; as why these Lights are rarely seen any where else but in the North; and never, that we hear of, near the Equator: as also why they are more frequently seen in *Iceland* and *Greenland*, than in *Norway*, though nearer the *Pole* of the *World*. For the Magnetical Poles, in this Age, are to the Westward of our Meridian, and more so of that of *Norway*, and not far from *Greenland*; as appears by the Variation of the Needle this Year observed, full twelve Degrees at *London* to the West.

The erect Position of the luminous Beams or *Stria* so often repeated that Night, was occasioned by the rising of the Vapour or lucid Matter nearly perpendicular to the Earth's Surface. For that any Line, erected perpendicularly upon the Surface of the Globe, will appear erect to the Horizon of an Eye placed any where in the same spherical Superficies; as *Euclid* demonstrates in a Plain, that any Line erected at Right Angles to it, will appear to be perpendicular to that Plain from any Point thereof. That it should be so in the Sphere is a very pretty Proposition,

note



not very obvious, but demonstrated from *Prop. 5. Lib. I. Theodosii Spheric.* For by it all Lines erect on the Surface pass through the Center, where meeting with those from the Eye, they form the Plains of Vertical Circles thereto. And by the Converse hereof it is evident, that this luminous Matter arose nearly perpendicular to the Earth's Surface, because it appeared in this erect Position. And whereas in this Appearance (and perhaps in all others of the kind) those Beams which arose near the *East* and *West*, as *L, M, N*, were furthest from the Perpendicular, on both sides inclining towards the *South*, whilst those in the *North* were directly upright: the Cause thereof may well be explained by the Obliquity of the Magnetical Curves, making still obtuser Angles with the Meridians of the *Terrella*, as they are further from its Poles.

Hence also it is manifest how that wonderful *Corona* that was seen to the Southwards of the *Vertex*, in the Beginning of the Night, and so very remarkable for its tremulous and vibrating Light, was produced; to wit, by the Concourse of many of those Beams arising very high out of the Circumjacent Regions, and meeting near the Zenith: the *Effluvia* whereof they consisted mixing and interfering one with another, and thereby occasioning a much stronger but uncertain wavering Light. And since it is agreed by all our Accounts that this *Corona* was tinged with various Colours, 'tis more than probable that these Vapours were carried up to such a Height, as to emerge out of the Shadow of the Earth, and to be illustrated by the direct Beams of the Sun: whence it might come to pass that this first *Corona* was seen coloured and much brighter than what appeared afterwards in some Places, where the Sight thereof was more than once repeated, after the Sun was gone down much lower under the Horizon. Hence also it will be easily understood that this *Corona* was not one and the same in all Places, but was different in every differing Horizon: exactly after the same manner as the Rainbow seen in the same Cloud is not the same Bow, but different to every several Eye.

Nor is it to be doubted, but the Pyramidical Figure of these ascending Beams is Optical: since according to all likelihood they are parallel sided, or rather tapering the other way. But by the Rules of Perspective, their Sides ought to converge to a Point, as we see in Pictures the Parallel Borders of straight Walks, and all other Lines parallel to the Axis of Vision, meet as in a Center. Wherefore those Rays which arose highest above the Earth and were nearest the Eye, seemed to terminate in Cusps sufficiently acute, and have been for that reason supposed by the Vulgar to represent *Spears*. Others seen from afar, and perhaps not rising so high as the former, would terminate as if cut off with Plains parallel to the Horizon, like truncate Cones or Cylinders: these have been taken to look like the Battlements and Towers on the Walls of Cities fortified after the ancient manner. Whilst others yet further off, by reason of their great Distance, good part of them being intercepted by the Interposition of the Convexity of the Earth, would only shew their pointed Tops, and because of their Shortness have gotten the Name of *Swords*.

Next



Next, the Motion of these Beams furnishes us with a new and, as it seems to me, most evident Argument to prove the diurnal Rotation of the Earth: (though that be a matter which at present is generally taken by the Learned to be past Dispute.) For those Beams which rose up to a Point, and did not presently disappear, but continued for some time, had most of them a sensible Motion from East to West, contrary to that of the Heavens; the biggest and tallest of them, as being nearest, swiftest; and the more remote and shorter, slower. By which Means, the one overtaking the other, they would sometimes seem to meet and jostle; and at other times to separate, and fly one another. But this Motion was only Optical, and occasioned by the Eye of the Spectator being carried away with the Earth into the East; whilst the exceeding rare Vapour of which those Beams did consist, being as I take it, raised far above the Atmosphere, was either wholly left behind, or else followed with but part of its Velocity, and therefore could not but seem to recede and move the contrary Way. And after the same manner as the Stars that go near the Zenith, pass over those Vertical Circles which border on the Meridian, much swifter than those Stars which are more distant therefrom; so these luminous Rays would seem to recede faster from East to West, as their Bases were nearer the Eye of the Spectator; and *e contra*, slower as they were further off.

Nor are we to think it strange, if after so great a Quantity of luminous Vapour had been carried up into the Ether out of the Pores of the Earth, the Cause of its Effervescence at length abating, or perhaps the Matter thereof consumed; these *Effluvia* should at length subside, and form those two bright *Laminae* which we have described, and whose Edges being turned to us were capable to emit so much Light that we might read by them. I choose to call them *Laminae*, because without doubt, though they were but thin, they spread Horizontally over a large Tract of the Earth's Surface. And whilst this luminous Matter dropt down from the upper Plate to the under, the many little white Columns were formed between them by its Descent; only visible for the Moment of their Fall. These by the Swiftness with which they vanish'd and their great Number, shewing themselves and disappearing without any Order, exhibited a very odd Appearance; those on the Right seeming sometimes to drive and push those on the left, and *vice versa*.

I have been obliged to omit several Particulars of less Moment: But these are the principal Phenomena; of whose Causes I should have more willingly and with more certainty given my Thoughts, if I had had the good luck to have seen the whole from Beginning to End; and to have added my own Remarks to the Relations of others: and especially if we could by any Means have come at the Distances thereof. If it shall by any be thought a hard Supposition that I assume the *Effluvia* of the Magnetical Matter for this Purpose, which in certain Cases may themselves become luminous, or rather may sometimes carry with them out of the Bowels of the Earth a sort of Atoms proper to produce Light in the



the Ether. I answer, That we are not as yet informed of any other kinds of *Effluvia* of terrestrial Matter which may serve for our purpose, than those we have here considered, *viz.* the Magnetical Atoms, and those of Water highly rarified into Vapour. Nor do we find any thing like it in what we see of the Celestial Bodies, unless it be the *Effluvia* projected out of the Bodies of Comets to a vast Height, and which seem by a *Vis centrifuga* to fly with an incredible Swiftnefs from the Centers both of the Sun and Comet, and to go off into Tails of a scarce conceivable Length. What may be the Constitution of these Cometical Vapours, we Inhabitants of the *Earth* can know but little, and only that they are evidently excited by the Heat of the Sun; whereas this Meteor, if I may so call it, seldom is seen but in the polar Regions of the World, and that most commonly in the Winter Months. But whatever may be the Cause thereof, if this be not, I have followed the old Axiom of the Schools, *Entia non esse temere neque absque necessitate multiplicanda.*

‡ Abr. Vol. II. p. 616. Lastly, I beg leave on this Occasion to mention what, near 25 Years since, I published in No. † 195. of these *Transactions*, *viz.* That supposing the *Earth* to be concave, with a lesser Globe included, in order to make that inner Globe capable of being inhabited, there might not improbably be contained some luminous *Medium* between the Balls, so as to make a perpetual Day below. That very great Tracts of the Etherial Space are occupied by such a shining *Medium* is evident from the Instances I have † already given. And if such a *Medium* should be thus inclosed within us; what should hinder but we may be allowed to suppose that some parts of this lucid Substance may, on very rare and extraordinary Occasions, transude through and penetrate the *Cortex* of our *Earth*, and being got loose may afford the Matter whereof this our *Meteor* consists. This seems favoured by one considerable Circumstance, *viz.* that the *Earth*, because of its diurnal Rotation, being necessarily of the Figure of a Flat *Spheroid*, the Thickness of the *Cortex*, in the Polar Parts of the Globe, is considerably less than towards the *Equator*; and therefore more likely to give Passage to these Vapours; whence a reason may be given why these Lights are always seen in the North. But I desire to lay no more Stress upon this Conceit than it will bear.

A Remark by  
Dr Rob nson,  
a. 349.p. 483.

2. I am also of opinion, that those Phosphorous or Luminous Appearances in the Firmament, proceed from the various *Effluvia* perspir'd out of our Globe, or passing thro' it; for I have seen those Lights over *Vesuvius*, the *Strombulo* Islands, and towards *Ætna* in dark Nights, when those *Vulcano's* were not flaming nor burning, their Sides and Tops being passable to Travellers at that time, and all their outward parts quiet. We are certain that *Iceland* and *Greenland* abound with *Vulcano's*; so may North East *Lapland*, North *Russia* and *Tartary*, where vast Chains of Mountains are said to run. The *Jesuits*, and other Travellers relate many prodigious Eruptions of Fires and Earthquakes towards the North of *China*; but nearer the Pole the Earth must be clos'd and pent up many



many Months, by the long severe Freezings and continual Snow and Ice, which relaxing towards Spring, may give vent to that vast Mass or Magazine of perspirable Matter, that had been kept so long in hot Subterraneous Prisons. This may be one Reason why Animal Bodies themselves are often sensible of Changes at that Season in our Climate, when Perspiration is upon such an Increase.

At *Paris*, the Light was so inconsiderable, that it was not regarded : n. 348 p. 430. But from a Letter to Mr. *Alexander Geekie*, Surgeon, dated on Board a Ship in *Nevis Road*, in *America*, *April 19. 1716.* we have copied the following Passage. ‘ On the sixth of *March*, at 9 P. M. we being in the ‘ Latitude of 45°. 36'. (off of the N. W. Coast of *Spain*). A clear ‘ Cloud appeared East of us, not far distant from our Zenith, which afterwards darted it self forth into a number of Rays of Light, every ‘ way like the Tail of a Comet, of such a great Length, that it reach’d ‘ within a short way of the Horizon. There likewise appear’d a Body ‘ of Light, N. N. E. of us, and continued as Light almost as Day, till ‘ after 12 a Clock. It appear’d at a good distance from us, and darkned ‘ on a sudden’.

Hence it should seem, that the Vapour which caused this Appearance, arose indifferently out of the deep Ocean Sea, as well as from the Land; by which we may conclude the great Subtilty of the Matter thereof, since it could permeate so great a Quantity of Water, and yet retain its Velocity; which is a Circumstance deserving the further Consideration of the Curious.

3. Since this, most of the same *Phænomena* have been repeated three several Nights successively, viz. On the last of *March*, and first and second of *April*. The best and fullest Description of the two first, is *A Return of the same Appearance. ibid.* from a Letter of Dr. *Brook Taylor*, LL. D. dated *April 2.* from *Cotterstock*, near *Oundle* in *Northamptonshire*, who thus describes them. ‘ On ‘ *Saturday Night* last, and last Night, I saw Appearances of the same ‘ kind, with those of *March 6*, but not to compare for Extent and ‘ Strength to the other. They both began soon after Sun-set, and continued till after 12, but how much longer I cannot tell. They were ‘ both about 10 or 15 Degrees to the Westward of the *North*, and took ‘ up about 80 Degrees of the Horizon; and the *Aurora* rose about 30 gr. ‘ high, with a dark Bottom, like what was seen in the first; and from ‘ whence there sprung out several Bodies of Light, which immediately ‘ run into Streams, ascending about 30, or at most 40 gr. high. There ‘ was no flashing nor waving Light, but in all other respects these ‘ Lights were of the same kind with what we saw at *London*. Indeed ‘ in that last Night, there was one *Phænomenon* like the flashing Light, ‘ for a Body of Light about 15 or 20 Degrees long, parallel to the ‘ Horizon, rose till it came about 6 Degrees above the black Basis, and ‘ then sent up two strong Streams of Light about 40 gr. high, which at ‘ top dash’d against one another, and disappear’d.’

At *London*, the first Night, *March 31.* It did not begin to radiate, till towards Mid-night, and was seen but by few curious Persons; the  
S Beams



Beams not rising very high, and scarce appearing over the Houses, were little taken notice of: but by the Relation of those that saw it, it was much more considerable than the next Night following *Easter-day*, for it then sent out but few and very short Beams, mostly terminating in a sharp Point, and presently disappearing. Only it beginning to stream so soon as it became Dusky, it was very observable, that those Rays which arose out of the West end of the luminous Arch, next the Sun, were enlightned by its Beams, and shew'd themselves much brighter than those which sprung up under the Pole, or to the Eastward thereof. And after Nine, till Mid-night, no more Beams arose; and the luminous Arch with its black *Basis*, settled down very low in the Northern Horizon.

The same two Nights, by the Observation of Mr. *William Lingen*, the like Appearance was seen at *Dublin*, about the Hours of Nine or Ten; at which time, in the former Night, it was near as Light as in a Moon-light Night. And from *France* we have an Account, that both those Nights, the same was seen at *Paris*, with much the same Circumstances as at *Dublin*. So that it seems this Meteor, though no ways comparable to that of the 6th of *March*, was seen not less than 150 Leagues, and probably much further.

The following Night, *April 2*. When it began to be dark, a luminous Arch appeared in the *North*, with a very narrow black Bottom under it, very low, and depress'd to the Horizon; nor was it seen at, or about *London*, to project any pointed Rays as the former.

But what was most remarkable that Evening was, what was seen at *London*, by that ingenious Gentleman *Martin Foulkes*, Esq; R. S. S. about Nine that Night. He being in the open Air at that time, saw in an Instant, a bright Ray of very white Light, appear in the East, out of the pure Sky, then very serene and still; it very much resembled the Tail of a Comet, and was about 20 gr. inclined from the Perpendicular to the Right, beginning about  $\gamma$  of *Bayer* in the *Corona Borea*, and terminating about the *Informis*, by some called *Cor Caroli*. This having appeared but a very short time, disappeared at once, as in a Moment. When on a sudden, such another Beam was instantly produced, not exactly in the same place, but in the same Situation. Its lower end being about 20 gr. high, was terminated exactly between  $\kappa$  and  $\gamma$ , in the Right Hand and Arm of *Hercules*, and the Middle of it past over  $\sigma$  and  $\epsilon$  in the Girdle of *Bootes*, and thence proceeded Westwards, leaving *Cor Caroli* four or five Degrees to the Northwards. After it had continued in this Posture near 10 Minutes immoveable among the Stars, it began to move slowly towards the North: and the lower end passing over the Northern Edge of the *Crown*, and the Ray it self over *Cor Caroli*, it grew fainter, and vanished, having continued in all about 20 Minutes. This latter with some Interruption was extended between *Castor* and *Pollux*, very far into the West. And about that time the same, or such another Beam was seen at *St. Asaph*, by Doctor *Stanley*, the Reverend Dean of that Church.



XXV. Feb. 5. 171 $\frac{2}{7}$ . at 8 at Night, an *Aurora Borealis* appear'd. It occupied at least a 6th or near a 5th part of the Horizon; it was low, and shot out bright Rays, and I believe would have appear'd very Light, had not the Moon then 5 Days old, shone at the same time, and the *Aurora* disappeared before Sun-set. Two late Northern Aurora's at Sutton at Hone in Kent, n. 351. p. 584.

Mar. 30. following, past Nine at Night, I saw another. 'Twas dim then, and its highest part cover'd the lowest Star in *Cassiopeia's* Chair. It seem'd not due North, but one Point to the West. About 10, it shot out bright Rays, high, and tending somewhat towards one another. Near it, there was (besides the Northern Brightness) a long Streak, not very broad, extended E. and W. which beginning in the Serpent's Head, near *Hercules's* Club, and covering *Arcturus*, proceeded near *Berenice's* Hair and so went over *Cor Leonis*, thence to the *Canicula*, and ended a little below that Star. It shone very bright at first, but faded away in about 8 or 9 Minutes. If it had Motion, which I am not sure of, it was Southward. I waited for the next Fit of Brightness of the *Aurora*, and in about 7 Minutes, the Eastern part of the Streak from the Serpent's Head to near *Berenice's* Hair, became visible again tho' dim, and was quite effac'd in 4 or 5 Minutes more, and I did not yet perceive any Change of its Place.

XXVI. Being in the Street, between 8 and 9 a Clock on Saturday last, (30 Martii) I perceived a Light over the Houses to the Northwards, little inferiour to that the Full Moon gives when she first rises. Upon this suspecting some such Meteor as we saw the last Year, I made all the haste I could into the Fields, where I immediately found my Conjecture verified; and was for some time agreeably entertain'd with the sight of an *Aurora Borealis*, attended with most of the *Phænomena* that have been describ'd in that very remarkable one of the 6th of March, 1715-6. The latter observed at London by Martin Folkes Esq; n. 352. p. 586.

The whole Northern part of the Horizon was in the same manner cover'd with somewhat resembling a black Cloud, from behind which issu'd a very considerable Light, whose lower part was pretty well defin'd by the common Edge of the Cloud, but the upper dy'd away more gradually. This upper Limb of the Light resembling the Arch of a Circle, whose highest Point between 9 and 10 of the Clock (when the Meteor was most considerable) was elevated about 12 Degrees, and bore as I imagin'd, about 20 deg. Westward of the due North. It touch'd the Horizon in the West at the distance of about 65 or 70 Degrees from the North, whence the whole intercepted Arch of the Horizon would have been of near 100 Deg. had not some few Degrees in the East been hid by Clouds which lay between us and the Meteor.

The seeming black Cloud, when I first saw it, ran nearly parallel to the Horizon, and at the distance of 6 or 7 Degrees: but in about half an Hour it changed its Figure very much, sinking down in the North to about half its height, and rising in the West near as much. What I principally



cipally took notice of this for, was that the Light issuing from behind it did not change with it, but remain'd of the same Figure, however the Cloud approached or receded from differing Parts of its Limb.

There arose at first some Streams in the *N. N. W.* but of no considerable Length, few of them passing 5 Degrees above the Arch; but beginning from behind the seeming Cloud, so as to be about 12 Degrees high in all. They were pointed at the Ends, and nearly vertical to the Horizon. Between times there was nothing but the Arch to be seen, and that only resembling a common *Aurora*; and again in an Instant, by a sort of tremulous Motion, several Parts of it would appear converted into a vast number of parallel Streams, for the most part very little higher than the Arch it self. About 20 Minutes before Ten, a small part of the Arch, almost due North, grew remarkably lighter than the rest, and continued to encrease for about half a Minute; when there suddenly broke out some very tall Streams of at least 60 Degrees high, as I found by one in particular which arose full North, and passing over the Pole Star it self, reach'd some Degrees beyond it. This was the most remarkable time of the Appearance, some such Lances, though not so high, immediately shooting out of the Place that first of all radiated, as did some more a good way to the East. They were all nearly Perpendicular to the Horizon, and most of them did arise quite from the black Substance at Bottom, tho' I saw some few that did not reach so low, appearing as if their lower Parts had been broken off. Some of them were full as bright as any I saw the last Year, the Axes (if I may so call them) of some of the tallest Streams coming up very near to the Colour of that pale Fire we see in some sorts of Lightning. About this time the Ground Westward was all covered with an odd sort of Mist, the same from which I remember last Year a great many People said there came an ill Smell, which I did not at all perceive; however as I remember it to be the very same Appearance, I thought it might not be improper just to take notice of it.

About 10 the *Phænomenon* very much decreas'd, and so continued till after 11, only sending up now and then 2 or 3 Streams. At half an Hour after 11 it was again pretty much encreas'd, and I saw it again send out some Streams almost as considerable as any I had before seen this Evening; the Arch yet continued, but not so entire; and from what I could judge, its middle was some Degrees nearer the North than when I first took notice of it. Till a quarter of an Hour before 12 the light continually abated, and then I left it; but a Watchman, I order'd to bring me an Account of it next Morning, tells me it continued till towards Day-break, but never stream'd remarkably after I went away. Tho' I could not this time see any Stars through the black Matter at Bottom, I am sensible it was not a Cloud, though it bore the Resemblance of one: for when a real Cloud (as several small ones did) came over any part of it, their Difference was very conspicuous.



I have since receiv'd two Letters, one from *Wisbich* in the Isle of *Ely*, the other from within 14 Miles of the *Bath*, both which take notice of it, though with no further Particulars, than that on *Saturday Night* they had seen the same Light, though not so considerable as in the beginning of *March* the last Year.

XXVII. 1. Upon *Tuesday, November 10. 1719.* in the Morning, *Jupiter* Another at London by Dr. Halley, n. 363. p. 1099. applying to the second in the Wing of *Virgo*, I got up about 5 of the Clock to observe him, and having had the Satisfaction to see my Calculus perfectly well answer the Heavens, I found certain white Streaks in the Sky, seemingly Perpendicular; which whilst I considered them seemed instantly to vanish, and soon after others came as instantaneously in their room. I began to imagine that this was likely to be some part of the *Phænomena* of the *Aurora Borealis*. But there appearing nothing like that luminous Arch which we have of late so often seen in the *North*, I knew not what to think; till looking up towards the *Zenith*, I perceived an entire *Canopy* of such kind of white *Striæ*, seeming to descend from a white Circle of faint Clouds, about 7 or 8 Degrees in Diameter, which Circle sometimes would vanish on a sudden, and as suddenly be renewed. I observ'd that the Center of this place of Concourse was not precisely in the *Zenith*, but rather 14 Degrees to the Southwards thereof; which I was well enabled to estimate by a Star, which on each return thereof shewed its self about the Center of the Circle. This Star is the 33d Star of the *Great Bear* in *Tycho's Catalogue*, whose distance from the Pole at this time is  $52\frac{1}{2}$  Degrees, and which about half an Hour past Five that Morning past the Meridian, so that those Rays centred very nearly on the Meridian it self. It was a very entertaining Sight, till such time as the Day-break began to obscure these Lights, which were but faint, though sufficiently distinguishable. They came none of them lower than about 30 or 40 Degrees of Altitude, and seemed not to have ascended from the Horizon. The Sky was perfectly serene and calm, which seems to be one of the concomitant Circumstances attending the *Aurora Borealis*, of which this was certainly a Species. For the Night following a Neighbour gave me notice of a strange streaming of Lights seen in the Air, which thereupon I attended from the Hours of  $9\frac{1}{2}$  to 11, when a Fog came so thick as to put an end to my Prospect. But during that whole time there ascended out of the *E. N. E.* and *N. E.* a continued Succession of whitish *Striæ*, arising from below; and after changing as it were into a sort of luminous Smoke, past over head with an incredible Swiftnefs, not inferiour to that of Lightning; and as it past, in some part of its Passage, seemed as it were gilded, or rather as if the Smoke had been strongly illuminated by a blaze of Fire below. Some of the *Striæ* would begin high in the Air, and a whole set of them subordinate to one another, like Organ Pipes, would present themselves with more rapidity than if a Curtain had been drawn from before them; some of which would die away where



where they first appeared, and others change into a luminous Smoke, and pass on to the Westwards with an immense Swiftnefs. And I am of Opinion, that had it not been for the Moon, then ten Days old and very bright, this for the time would have been reckoned as considerable an Appearance as that of the 6th of *March*, 1716.

The same in  
Devonshire, by  
Mr. William  
Maunder, n.  
363 p. 1101.

2. On *Monday* the 26th of *October* between 7 and 8 in the Evening, at *Crumys Morchard* in *Devonshire*, I saw some small Appearance of it, viz. 3 or 4 large Coruscations in form of Pyramids, of reddish Colour, inclining to Yellow, which rose about 50 Degrees above the Horizon, and continued but few Minutes. But the North part of the Hemisphere was very bright and red all the Evening both before and after, till 10, if not longer.

*Tuesday*, *November* 10. These Lights were seen again about 4 in the Morning, of which some say (to use their own Expressions) that the Element opened sometime at one place, then at other; from whence came great shining Lights that continued a while, and then went away by Degrees, and the Holes closed up again. This continued till Day break.

The Evening following coming from *Tiverton* about half an hour after Eight, I saw the North part of the Horizon very light and reddish (notwithstanding the Moon being about 10 Days old, was then in or past the Meridian, and shone very bright) in a short time the streaming luminous Rays began to appear very plain, some in one shape, some another, many of them like Cones or Pyramids, but most of them baldly terminated; some of which mounted very high, almost to the Zenith, to which place, or near, they all or most seemed to point. Shortly after there appeared a long Streak of about 30 Degrees, parallel to the Horizon, and about 15 or 20 distant from it, and about 2 or 3 broad, but baldly terminated and of a fiery red Colour: which sent out some of the same streaming Beams towards the Zenith. About 6 or 7 Minutes after there appeared (somewhat sudden) a Circular Figure like an Iris, but twice as broad, of a pale Colour. The East part was terminated by the Horizon at full East, if not something to the South, and the West End about North West; the upper part of its Arch being 50 or 60 Degrees high, great numbers of luminous Rays darted from upward and downwards, (or else passing cross it from the Horizon) at oblique Angles pointing to the Zenith, especially from the North East part. This continued, as near as I can guess (by the distance I rode) about 8 or 9 Minutes, when it divided and disappeared. After an Interval of 3 or 4 Minutes, another Iris-like Figure appeared, (of a Colour (as it seemed) paler than any of the streaming Lights had been) whose Diameter was less than that of the former, and shewed more than its Semicircle above the Horizon, the upper part of its Arch approaching near the Zenith. I could not observe any Rays to pass from, (or a cross) this as from the other. The Centre of this last was much more to the West than that of the first. After the Continuance of a Minute or two, it began to break



in the upper part of its Arch, and shining Particles being sent out from both its broken Ends towards the Zenith, (to which they were near before) or rather a little beyond it to the South or South West, they there formed a sort of *Corona*, curving and bending somewhat like Flames reverberated on the Arch of an Oven: tho' this expresseth it but badly, yet I know not how to describe it better. It seemed to me and others to be finely tinged with various Colours, Red, Yellow and Blueish, &c. and sent out every way from it (except South and South-west) long Flame coloured Rays. After this had continued about two Minutes, its shining Light abated, and it left behind it for some Minutes, something like a whitish Cloud (like in Colour to what the Light on the 19th of *March* last left behind it, after the fiery Particles were extinguished, but thinner.)

All this while the Moon shone out very bright, from which this *Corona* was not very far distant, perhaps not twenty Degrees, to the North East. After this there continued to be sent up many fiery colour'd or yellowish streaming Lights, sometimes more, sometimes less, now here, now there, all along the North part of the Hemisphere, but mostly from the North East. All this while something like small whitish Clouds (which to me seemed to move towards the Zenith, or to point a little more Southward, but disappear'd as they approached the Moon) were carried very swiftly, and at very short Intervals, mostly coming from the East and North East, but many also from North and North West. We took but little notice of this at first, supposing it had been nothing but the Reflection of the other Lights, or the Shadows of the Clouds (whereof the North parts were pretty full) as the Streams of Light past behind them: But at last we observed that when the Lights at any time abated, these kind of Clouds continued to fly as swift and frequent as ever. This I saw till 12 or 1 next Morning: many others saw it next Morning till almost break of Day, when it appeared much more red and fiery than it was in the Evening; the Moon perhaps being then set. Some People observ'd tall Cones to arise in the East, and to be carried to the West, pretty swiftly in an erect Position, but I saw them not.

3. The Afternoon was very Calm and Serene; about six in the Evening the Sky was tinged with a strange kind of Light, and some Streams began to project from the North and North East. One of them arose about N. by E. and was nearly a Subtense of an Arch between that and South West by West; it was a little curvated toward the Sun, and what I saw of it (for the North part of the Horizon was conceal'd by Houses) very much resembled the Tail of a Comet: About the same time there was one or two which arose in the East, ascending obliquely so as to leave the Zenith several Degrees to the Northward.

These *Striæ* continu'd to appear and disappear alternately till toward Eight in the Evening; they were *Pyramidal*, and their *Vertices* frequently projected several Degrees to the South of our Zenith.



Between 9 and 10 I was agreeably surpriz'd with a kind of Coruscation, or Flashing, that shew'd it self between twenty and sixty Degrees from the *Zenith*, in the South or South by West; and which from four or five, sometimes from more places at once, darted with a Velocity not much inferior to that of Lightning; and by interfering with each other produc'd a beautiful Tremour or Undulation in that subtile *Vapour*, which I cannot better illustrate, than by comparing it to the Beams of the Sun, reflected on a Ceiling from the Surfaces of two or three Basons of Water: These *Waves* of Light were only visible at the Instant of Coruscation, and were of a pale whitish Colour, somewhat resembling the Flashes produced by the violent Agitation of Quicksilver in an exhausted Receiver; but so strong that a Gentleman who about that time was in a Room by himself, without a Candle, assur'd me he took it for common Lightning: Thus it continued incessantly for more than an Hour, during which time several lucid *Areas*, like little Clouds, discover'd themselves in the pure Sky, and after they had continued about five or six second Minutes, as near as I could guess, would instantaneously disappear; most of them pretty much resembled a very thin white Smoke or Vapour illuminated by the Full Moon.

About three quarters past 10, this Vapour was almost spent, or by a brisk Gale at South by West dispers'd and driven to the Northward; at which time, between the West and North, a vast body of it, like a very bright Flame-colour'd *Crepusculum*, seem'd to be fix'd: From this Basis several Beams or *Stria* of shining matter were at uncertain Intervals emitted; and tho' it was not sensible to the Eastward of the North, yet several mighty Pillars were also ejected from thence: one, which if I mistake not, arose directly under the Pole, was, above all others that had preceeded it, both as to its Magnitude and Density so surprizing, that I'm persuaded the smallest Print might have been read by the Light thereof, had not that of the Moon, which shone very bright, pretty much effac'd it: 'twas ting'd with a kind of yellow and violet Colour. In about two or three Minutes it died away, and was succeeded by others of an inferior Order: It was now about a quarter past Eleven of the Clock, and nothing but repeated *Phases* of the same Spectacle offering themselves to View; the Vibrating Motion had ceased; the Vapour shewed it self no longer in lucid *Areas*; the Streams of Light were not so frequent, and those more languid than before; and the bright *Aurora* having settled nearer the Horizon, I concluded the *Scene* was at an End, and accordingly gave over the Quest of new *Phænomena*, with only observing that about N.E. there appeared some Clouds that reflected an unusual kind of reddish Light. Others, who through a Principle of Fear sat up longer than I did, represent the End with very surprizing Circumstances; but as it escap'd the Eyes of those who were best qualified to oblige the World with an History of it, so I despair of adding any thing that may be satisfactory: and there were no doubt many Circumstances of weight that I did not observe: for the wonderful Variety this *Phænomenon* afforded, and the frequency



frequency and suddenness of its Alterations, made it impossible for the Eye of any single Person to trace it.

On *Tuesday* the 24<sup>th</sup> of *November*, we had the same *Phænomena* repeated, though not with the same Variety: About a quarter past ten at Night, a vast Body of shining matter was collected between N. W. by West, and N. by E. in the form of the Segment of a Circle, whose Center was about 25 or 30 Degrees below the Horizon; from its *Periphery* a few short *Pyramidal* Streams, of the same luminous Vapour, ascended by a slow and nearly uniform Motion, and were exceeding rare so as not to efface the smallest of the fix'd Stars; and in a Minute or two vanished: It was very remarkable that the Light which that Collection of Vapour emitted was so great, that in the otherwise very dark night, I cou'd thereby (at three quarters past Ten) read the Title of the last *Philos. Transact.* which then happened to lye on my Desk; and at four or five Yards distance see the smallest Books in my Study.

XXVIII. I had the Pleasure to find the Observations made upon the above describ'd Appearance very agreeable to what I had my self observed the Evening of that Day: and to what I did not at that time observe, but had an Opportunity of observing in the night of *December* 11. I believe much more plainly than Dr. *Halley* had in the night of *November* 10. *Another at Streatham in Surry, by Mr. Tho. Hearne, n. 363. p. 1107.*

*December* 11. about one a Clock at night (or rather in the Morning of *December* 12) I was called to observe Coruscations which appeared of a much different Colour, and in a very different manner from any I had before seen.

The Streams of Light that darted upwards from the Horizon seemed to be at considerably a greater distance, but not at all in less quantity than those of *November* 10. But their meeting in a Point near the *Zenith*, and there forming a kind of *Canopy*, was what was particularly remarkable in the *Manner* of the Coruscations now different from those of *November* 10.

The Streams of Light rose from the Horizon only towards the North, and on each hand towards N. East and N. West: But near the *Zenith* a Canopy was formed of Streams of Light meeting in a Point, not only from those Quarters, but also from the South, &c. Only to those Points they extended downwards from the *Zenith* but a little Way, and were neither in so great quantity nor quite so bright as those Northwards. At first I thought the Point in which the Streams met was exactly the *Zenith*, but upon observing it something longer, I found it was not so, but a few Degrees to the South of the *Zenith*. The Streams of Light near the *Zenith*, which formed this Canopy, were of a pretty bright Colour, and in great Quantity, and darted very swiftly.

On each side of the N. towards E. and W. but not exactly in the N. it self (at least when I saw it) from about 10 or 15° to 40 or 50° above the Horizon, the Streams were of a glowing red Colour, whereas all that I



had ever seen before were very pale. The Redness was like that of a burnt Brick, and nearest of any thing I have seen to the Colour, which remained for a few Minutes, like that Tract through which the Meteor passed in the Spring.

The Streams appeared of this fierce Colour when I first saw the Coruscations, and continued so for some time, till the Redness by Degrees wearing off, in about  $\frac{1}{4}$  of an Hour they appeared of the usual Paleness, when I left them still forming a Canopy near the Zenith, as is above describ'd. The Air was very calm and serene, not a Breath of Wind stirring.

The Moon was now a Day or two older than it was *November 10.* and a good deal farther to the W. than when I saw the Coruscations, that Night being then near full South. She had now round her what is commonly call'd a Burr, larger than ordinary, and several lucid Clouds at a little distance.

Several extraordinary  
Meteors or  
Lights in the  
Sky. By Dr.  
Edmund  
Halley, n. 341.  
p. 159.

Phil. Trans.  
n. 135. p. 863.  
Abr. Vol. II.  
p. 200.

XXIX. The *Theory* of the Air seemeth at present to be perfectly well understood, and the differing Densities thereof at all Altitudes, both by Reason and Experiment are sufficiently defined; for supposing the same Air to occupy Spaces reciprocally proportional to the Quantity of the superior or incumbent Air, I have elsewhere proved that at 40 Miles high the Air is rarer than at the Surface of the Earth about 3000 times; and that the utmost Height of the Atmosphere, which reflects Light in the *Crepusculum*, is not fully 45 Miles. Notwithstanding which, 'tis still manifest that some sort of Vapours, and those in no small Quantity, arise nearly to that Height. An Instance of this may be given in the great Light the Society had an account of from Dr. Wallis, which was seen in very distant Counties almost over all the South part of *England*. Of which though the Doctor could not get so particular a Relation, as was requisite to determine the Height thereof, yet from the distant Places it was seen in, it could not but be very many Miles high.

So likewise that Meteor which was seen in 1708. on the 31<sup>st</sup> of *July*, between Nine and Ten a Clock at Night, was evidently between 40 and 50 Miles perpendicularly high, and as near as I can gather, over *Shereness* and the *Buoy on the Nore*. For it was seen at *London* moving horizontally from *E. by N.* to *E. by S.* at least 50 Degrees high, and at *Redgrave* in *Suffolk*, on the *Tarmouth Road*, about 20 Miles from the East Coast of *England*, and at least 40 Miles to the Eastward of *London*, it appeared a little to the Westwards of the South, suppose *S. by W.* and was seen about 30 Degrees high, sliding obliquely downwards. I was shown in both Places the Situation thereof, which was as described. We may securely conclude, that it was not many Miles more Westerly than *Redgrave*, which as I said before, is above 40 Miles more Easterly than *London*. Suppose it therefore, where perpendicular, to have been 35 Miles East from *London*; and by the Altitude it appear'd at in *London*, viz. 50 Degrees, its Tangent will be 42 Miles, for the Height of the Meteor



Meteor above the Surface of the Earth; which also is rather of the least, because the Altitude of the Place shewn me, is rather more than less than 50 Degrees: and the like may be concluded from the Altitude it appear'd in at *Redgrave*, near 70 Miles distant. Though at this great Distance, it appear'd to move with an incredible Velocity, darting in a very few Seconds of Time, for about 12 Degrees of a great Circle from North to South, being very bright at its first Appearance: and it died away at the End of its Course, leaving for some time a pale Whiteness in the Place, with some Remains of it in the Track where it had gone; but no hissing Sound as it past, or Bounce of an Explosion were heard.

It may deserve the Honourable Society's Thoughts, how so great a Quantity of Vapour should be raised to the very Top of the Atmosphere, and there collected, so as upon its Accension or otherwise Illumination, to give a Light to a Circle of above 100 Miles Diameter, not much inferior to the Light of the Moon; so as one might see to take a Pin from the Ground in the otherwise dark Night. 'Tis hard to conceive what sort of Exhalations should rise from the Earth, either by the Action of the Sun or subterranean Heat, so as to surmount the extream Cold and Rareness of the Air in those upper Regions: But the Fact is indisputable, and therefore requires a Solution.

Like to this, but much more considerable, was that famous Meteor which was seen to pass over *Italy* March 21. O. S. Anno 1676. about an Hour and  $\frac{3}{4}$  after Sun-set, which happen'd to be observed and well consider'd by the famous Professor of Mathematicks in *Bononia* *Geminian Montanari*, as may be seen in his *Italian* Treatise about it, soon after publish'd at *Bononia*. He observes that at *Bononia*, its greatest Altitude in the S. S. E. was 38 Degrees, and at *Siena* 58 to the N. N. W. that its Course by the Concurrence of all the Observers was from E. N. E. to W. S. W. that it came over the *Adriatick* Sea as from *Dalmatia*: that it crost over all *Italy*, being nearly vertical to *Rimini* and *Savigniano* on the one Side, and to *Leghorn* on the other: that its perpendicular Altitude was at least 38 Miles: that in all Places near this Course, it was heard to make a hissing Noise as it passed, *Ronzare, Far strepito comme un fuoco artificiale, Fisciare per aria comme un Raggio di polve*; that having past over *Leghorn*, it went off to Sea towards *Corfica*, and lastly, that at *Leghorn* it was heard to give a very great Blow, *Tuono di maggior rumori di grossa Cannonata*; immediately after which another sort of Sound was heard like the ratling of a great Cart running over Stones, which continued about the time of a *Credo*.

He concludes from the apparent Velocity it went on with at *Bononia*, at above 50 Miles Distance, that it could not be less swift than 160 Miles in a Minute of Time, which is above ten times as swift as the diurnal Rotation of the Earth under the Equinoctial, and not many times less than that wherewith the annual Motion of the Earth about the Sun is performed. To this he adds the Magnitude thereof, which appeared at *Bononia* bigger than the Moon in one Diameter, and above half as big again



again in the other; which with the given Distance of the Eye, makes its real lesser Diameter above half a Mile, and the other in Proportion. This supposed, it cannot be wondred that so great a Body moving with such an incredible Velocity through the Air, though so much rarified as it is in its upper Regions, should occasion so great a hissing Noise, as to be heard at such a Distance as it seems this was. But 'twill be much harder to conceive, how such an *impetus* could be impressed on the Body thereof, which by many Degrees exceeds that of any Cannon Ball; and how this *impetus* shou'd be determined in a Direction so nearly parallel to the Horizon; and what sort of Substance it must be, that could be so impelled and ignited at the same time; there being no *Vulcano* or other *Spiraculum* of subterraneous Fire in the *N. E.* parts of the World, that we ever yet heard of, from whence it might be projected.

I have much considered this Appearance, and think it one of the hardest things to account for, that I have yet met with in the *Phænomena* of *Meteors*, and am induced to think that it must be some Collection of Matter form'd in the *Æther*, as it were by some fortuitous Concourse of Atoms, and that the Earth met with it as it past along in its Orb, then but newly formed, and before it had conceived any great *Impetus* of Descent towards the Sun. For the Direction of it was exactly opposite to that of the Earth, which made an Angle with the Meridian at that time (the Sun being in about 11 Degrees of *Aries*) of 67 Gr. that is, its Course was from *W. S. W.* to *E. N. E.* wherefore the *Meteor* seem'd to move the contrary Way: And besides falling into the Power of the Earth's Gravity, and losing its Motion from the Opposition of the *Medium*, it seems that it descended towards the Earth, and was extinguish'd in the *Tyrrhene Sea*, to the *W. S. W.* of *Leghorn*. The great Blow being heard upon its first Immersion into the Water, and the ratling like the driving a Cart over Stones, being what succeeded upon its quenching; something like which is always observed upon quenching a very hot Iron in Water.

Mr. *Gottfried Kirch*, in an Appendix to his *Ephemerides* for the Year 1688, gives us this remarkable Relation of much such another Appearance.

*Die 9 Jul. st. vet. 1686. Hora 1½ matutina, Globus ardens cauda præditus in 8½ Gr. Aquarii ☿ 4 Gr. Sept. apparuit, qui per semiquadrantem Horæ immotus persistit, cujus diameter semidiametrum Lunæ circiter æquabat. Primo lux tanta erat, ut ejus ope sine candelis legere potuissemus: postea pedetentim in loco suo evanescebat. Phænomenon istud dicto tempore multis aliis in locis pariter visum est, præsertim Schlaizii, oppido undecim milliaribus Germanicis abhinc (i. e. a Lipsia) versus Meridiem distante, altitudine circiter 60 Gr. ab Horizonte meridiano. At the time of this Appearance the Sun was in 26½ Gr. of ☿, and by the given Place of the Meteor, 'tis plain, it was seen about ¾ of an Hour past the Meridian, or in S. by W. and by its Declination it could not be above 24 Degrees high at *Leipsic*, though the same at *Schlaize* was about 60 Gr. high: The Angle therefore at the Meteor was about 36 Gr. whence by an easy calculus it*

will



will be found, that the same was not less than 16 German Miles distant in a right Line from *Leipsick*, and above  $6\frac{1}{2}$  such Miles perpendicular above the Horizon, that is at least 30 English Miles high in the Air. And though the Observer says of it, *immutus persistit per semiquadrantem bore*; 'tis not to be understood that it kept its Place like a fixt Star, all the time of its Appearance; but that it had no very remarkable progressive Motion. For himself has at the End of the said *Ephemerides* given a Figure of it, which he has marked *Fig. D.* whereby it appears that it darted downwards obliquely to the Right Hand, and where it ended, left two Globules or Nodes, not visible but by an Optick Tube.

The same Mr. *Gottfried + Kirch* gives us a Relation of such another luminous Meteor seen likewise at *Leipsick* on the 22d of May 1680. *st. vet.* about three in the Morning, which though himself saw not, was yet there observed by divers Persons who made various Reports of it, but the more intelligent agreed that it was seen descending in the North, and left behind it a long white Streak where it had past. At the same time at *Haarburgh* the like Appearance was seen in N.E. or rather N.N.E. as also at *Hamburgh, Lubeck* and *Stralsund*, all which are about 40 German Miles from *Leipsick*: but in all these Places, by Persons unacquainted with the manner of properly describing things of this kind. So that all we can conclude from it is, that this Meteor was exceeding high above the Earth, as well as the former.

*† Neue Him-  
mels Zeitung.  
Nuremb. 1681.  
vers. prin.*

All the Circumstances of these *Phænomena* agree with what was seen in *England* in 1708, but it commonly so happens that these contingent Appearances escape the Eyes of those that are best qualified to give a good Account of them. 'Tis plain however that this sort of luminous Vapour is not exceedingly seldom thus collected.

XXX. Since the foregoing Discourse was writ, turning over the *Ephemerides* of *Kepler*, I accidentally hit upon another, prior to all those above described, and which was seen all over Germany. Of this the Words of *Kepler* are: *Die 7. Nov. 1622. Meteorum ignitum, Globus ardens ab occasu in ortum volans tota passim Germania fuit conspectus. In Austria etiam fragorem exauditum affirmarunt quasi a fulmine; quod vanum tamen puto: nihil enim tale confirmant descriptiones quæ extant.* Yet neither this, nor any of the other hitherto described, seem to come up in any Circumstance to this late Appearance; of which I am in hopes to give a satisfactory Account, being enabled by the very many Relations thereof communicated to the *Royal-Society*, from most parts of the Kingdom; though it was not my good Fortune to see it my self; and though very few of our Countrymen who best know the Stars, had better luck.

*Meteor seen  
all over En-  
gland, March  
19. 1718-9.  
By Dr. Halley,  
n. 360. p. 978.*

First, Our very worthy Vice-President Sir *Hans Sloan*, Baronet, being abroad at that time, happened to have his Eyes turned towards it, in its very first Eruption; and the next Day he was pleased to give me in Writing what he had with great Exactness noted about it, in the Terms following: ' On *Thursday March 19. 1718*, passing along Eastward by  
the



' the N. E. Corner of *Southampton-street* in *Bloomsbury-Square*, *London*,  
 ' at about a Quarter after Eight at Night, I was surpriz'd to see a sud-  
 ' den great Light, much beyond that of the Moon, which shone then  
 ' very bright. I turn'd to the Westward where the Light was; which I  
 ' apprehended at first to be artificial Fire-works or Rockets. The first  
 ' place I observ'd it in, was about the *Pleiades* Northerly, whence it  
 ' moved after the manner, but more slowly than a falling Star, in a seem-  
 ' ing direct Line, descending a little beyond, and withal below, the  
 ' Stars in *Orion's Belt* then in the S. W. The long Stream appear'd to  
 ' me to be branched about the middle, and the *Meteor* in its way turn'd  
 ' Pear-fashioned or tapering upwards. At the lower end it came at last  
 ' to be bigger and Spherical, though it was not so big as the Full Moon.  
 ' The Colour of it was whitish, with an Eye of Blue, of a most vivid  
 ' dazzling Lustre, which seem'd in Brightness very nearly to resemble,  
 ' if not surpass that of the Body of the Sun in a clear Day, beheld by  
 ' the naked Eye. This Brightness obliged me to turn my Eyes (which  
 ' had their Pupils adapted to the Light of the Moon) from it several  
 ' times, as well when it was a Stream, as when it was Pear-fashion'd  
 ' and a Globe; tho' I had a great Curiosity to observe it with Attention.  
 ' It seem'd to move in about half a Minute or less, about the Length  
 ' of  $20^{\circ}$ , and to go out, as I guess'd, about as much above the Horizon.  
 ' There was left behind it, where it had pass'd, a Track of a cloudy or  
 ' faint reddish yellow Colour, such as red-hot Iron or glowing Coals  
 ' have, which remained more than a Minute, seem'd to sparkle, and  
 ' kept its Place without falling. This Track was interrupted, or had a  
 ' Chasm towards its upper end, at about two Thirds of its Length. I  
 ' did not hear any Noise it made, but the place where the Globe of  
 ' Light had been, remain'd, after it was extinct, of the same reddish  
 ' yellow Colour with the Stream for some time, and at first some Sparks  
 ' seem'd to issue from it, such as come from red-hot Iron beaten on an  
 ' Anvil. The Surprise, Brightness of the Light, and Noise of the  
 ' People upon the Variations of the Appearance, calling to one another  
 ' to observe what they never had observ'd in their Days, and thought  
 ' to be prodigious, hinder'd me from taking notice or remembering any  
 ' thing farther about it'.

All the Relations, however otherwise differing, agree in this, that the  
 Splendour was little inferior to that of the Sun; that within Doors the  
*Candles* gave no manner of Light, and in the Streets not only all the  
*Stars* disappear'd, but the *Moon* then nine Days old, and high near the  
 Meridian, the Sky being very clear, was so far effaced as to be scarce seen,  
 at least not to cast a Shade, even where the Beams of the Meteor were  
 intercepted by the Houses: so that for some few Seconds of Time, in all  
 respects it resembled perfect Day.

The Time when this happen'd was generally reckoned at a quarter  
 past Eight; but by the more accurate Account of the Reverend Mr. *Pound*  
 (who only saw the Light) agreeing with what has been sent us from the  
*Parisian*



*Porifian* Observatory, it appears to have been at 8h. 8' apparent Time at *London*. And the Sun being then in  $9\frac{1}{2}$  gr. of *Aries*, the Right Ascension of the Mid-Heaven was 130 gr. 45', whereby the Position of the Sphere of fixt Stars is given. Hence the *Lucida Pleiadum* will be found at that time to have been  $25\frac{1}{4}$  gr. high, in an *Azimuth* 6 gr. to the Northward of the West, and consequently the Arch the Meteor moved in, was inclined to the Horizon with an Angle of about 27 gr. having its Node or Intersection therewith, nearly *South South West*; as will be more evident by what follows. At *Oxford* five Minutes earlier, Mr. *John Whiteside*, R. S. Soc. Keeper of the *Ashmole Museum*, and very skilful in both Mathematical and Physical Matters, immediately after the Extinction of the Meteor, made haste out to see what it might be, and well consider'd the Situation of the Track it had left in the Sky: He found it to have past about  $1\frac{1}{2}$  Degree above the preceding Shoulder of *Orion*, and about  $3\frac{1}{2}$  gr. above the middle of his *Belt*, where there appear'd a luminous *Nubecula* of reddish Light, being a Dilatation of the Track, seeming to have been occasioned by some Explosion there; and by what he could learn from those that saw it, it was thereabout that it broke out, and first began to efface the Stars. Hence it proceeded as to sense in an Arch of a great Circle, and passing in the middle between the Tail of *Lepus* ( $\theta$  *Bayero*) and  $\beta$  in the Fore-Foot of *Canis major*, it terminated about  $\xi$  in the Breast of the same, nearly in 95 gr. of Right-Ascension, with 23 gr. South Declination: and at the place of its Extinction there remained a large whitish *Nebula*, much broader and of a stronger Light than the rest of the Track, which he took for a certain Indication of a very great Explosion made there. By Computation it will be found that the Angle this Track made with the Horizon of *Oxford* was nearest 40 gr. and its Intersection due S. S. W. and that the place of its Extinction was about 9 gr. above the Horizon, in the Azimuth of 32 gr. to the West. At *Worcester* Mr. *Nicolas Fatio*, a Person greatly skill'd in Astronomical Affairs, saw this Meteor descend obliquely towards the South, making an Angle with the Horizon of about  $65^{\circ}$ , and intersecting it about S. S. W.  $\frac{1}{2}$  S, as may be collected from a Scheme thereof sent up by him, and communicated to the *Royal Society*, seeming to be design'd with sufficient Exactness. By this the Track left all *Orion* and *Canis major* to the Westward, and divided the Distance between *Sirius* and *Procyon*, so as to be almost twice as far from *Procyon* as *Sirius*. The Time here was one Minute before Eight; this City being about 9' of Time to the West of *London*, and consequently the Right-Ascension of the Mid-Heaven  $128\frac{1}{2}$  gr.

Now the Situation of the three Cities, *London*, *Oxford*, and *Worcester* being nearly on the same W. N. W. Point, whereon the Track of the Meteor had its greatest Altitude above the Horizon, equal to the Angle of its visible Way; if we suppose it at *London* to have been 27 gr. high, and at the same time at *Worcester* to be 65 gr. high, in the Plane of the Vertical Circle passing through *London* and *Worcester*; supposing likewise the Distance between them to be 90 Geographical Miles, or one Degree



Degree and half of an Arch of a great Circle of the *Earth*, we shall by a Trigonometrical *Calculus*, too obvious to be here inserted, find the perpendicular Height to have been 64 such Miles; and the Point over which it was then perpendicular to have been 30 such Miles *W. N. W.* from *Worcester*. And the Geographical Mile to the *English* Statute Mile being as 23 to 20, this Height will be no less than  $73 \frac{1}{2}$  *English* Miles. The place also directly under it will be found to be about *Prestain* on the Confines of *Hereford* and *Radnor*-Shires. Nor can we be much out in this Determination, the *Oxford* Observation concurring nearly in the same Conclusion.

This Altitude being added to the Semidiameter of the Earth as *Radius*, becomes the *Secant* of Eleven Degrees, so that the Meteor might be seen above the Horizon in all Places not more than 220 Leagues distant from it. Whence it will not be strange that it should be seen over all Parts of the Islands of *Great Britain* and *Ireland*, over all *Holland* and the hither Parts of *Germany*, *France* and *Spain*, at one and the same instant of Time.

This suggests a very great use that might be made of these momentaneous Phenomena, to determine the *Geographical Longitudes* of Places. For if in any two Places two Observers, by help of *Pendulum* Clocks duly corrected by *Celestial* Observation, do exactly note at what Hour, Minute and Second such a Meteor as this blows up and is extinguish'd, the Difference of those Times will be the Difference of Longitude of the two Places, as is well known. Nor does it require so much as the Use of a *Telescope*, as in the Methods hitherto put in Practice for that Purpose; so that if these Appearances could be predicted, and notice given of their coming, that we might know when to expect them, I should make no Difficulty to prefer this way of settling the *Geography* of a Country before all others.

Having thus fix'd one Point in the Line of its Motion, let us now consider what course the Meteor took from thence. And first at the Town of *Kirkby-Stephens*, on the Borders of *Yorkshire* and *Westmoreland*, in a Meridian very little to the Westward of *Worcester*, but about  $2 \frac{1}{2}$  *gr.* more to the North, it was observ'd to break out as from a dusky Cloud, directly under the Moon, and from thence to descend, nearly in a Perpendicular, almost to the Horizon. Now the Moon being at that time in the third Degree of *Leo*, was about half an Hour past the Meridian, and consequently much about a point to the West, or *S. by W.* and the Situation of *Prestain* from *Kirby Stevens* being sufficiently near upon the same Point, it follows that the Direction of the Track of the Meteor was according to the great Circle passing over those two Places. And this is further confirm'd by the Observation of *Sam. Crumys*, Esq; *Reg. Soc. Soc.* who at *Tiverton*, about twelve Geographical Miles nearly due North from *Exeter*, observed the first Explosion of this Meteor exactly in his Zenith, as he was assured by applying his Eye to the side of his Door, which he took to be perpendicular, and looking upwards: And from thence he saw it descend to the Southwards directly in  
the



the same Azimuth, without declining either to the Right or Left; hence it is plain, that the Track likewise pass'd over this Place, which by our best Maps is found to lie in a Line with *Prestain* and *Kirby-Stevens* with sufficient Exactness; so that we shall take it for granted that this was the very Course it held.

On this Supposition, that the first Explosion, attended with the reddish *Nubecula*, was directly over *Tiverton*, we have the *Oxford* Observation to compare with it, in order to determine more nicely the perpendicular Altitude there. At *Oxford* this *Nubecula* was found to be  $3\frac{1}{2}$  gr. above the middle Star of *Orion's Girdle*, at 8h. 3', and was therefore  $26\frac{1}{2}$  gr. above the Horizon; and the Distance between *Oxford* and *Tiverton* being  $1^{\circ} 55'$  or 115 Geographical Miles: it will be as the Sine of  $61^{\circ} 35'$  to the Sine of  $63^{\circ} 30'$ . so the Semidiameter of the Earth being  $3437\frac{3}{4}$  such Miles, to 3498 Miles distance of the Meteor from the Center of the Earth; from which deducting the Semidiameter, there remains  $60\frac{1}{4}$  Geographical Miles for the height of the Meteor above *Tiverton*: And that this was so is confirmed by the Observation of the Reverend Mr. *William Derham*, who at *Windsor* saw the aforesaid *Nubecula* about two degrees above the most Southerly of the Seven Stars in the Shield of *Orion*; that is (the Time being 8h. 6') in the Altitude, of  $23\frac{1}{2}$  gr. whence, the distance between *Tiverton* and *Windsor* being 150 measur'd Miles, or 130 Geographical, by a like Proportion we shall find the same Height of the Meteor 60 such Miles, wanting only one Quarter. So that in a round Number we may conclude it to have been just 60 Geographic or 69 Statute Miles above the Earth's Surface. Nor is it possible to come at a precise Determination of this matter, by reason of the Coarseness and Inaccuracy of our *Data*, which were only the Notes of Persons under the Surprize of the Suddenness of the Light, and no ways pretending to Exactness: however, such as they are, they abundantly evince the height thereof to have exceeded 60 *English* Miles, not to say 38 or 40, as some would fain have it.

I was unwilling to leave off, till I had pitcht upon some Hypothesis that might subject the Motion of this Meteor to a *Calculus*, that the Curious might be able to compute the visible way thereof, either in respect of the Horizon, or among the fixt Stars: This I found might be done with tolerable Exactness, supposing that it mov'd in the Arch of a Circle concentrick with the Earth, but 60 Geogr. Miles without it; and that the Point of the first Explosion was over the Lat. of  $50^{\circ} 40'$  and  $3^{\circ} 40'$  to the West of *London*; and that of the last Extinction over Lat.  $47^{\circ} 40'$  with  $4^{\circ} 50'$  West Longitude: The Time being fixt to 8 Minutes past Eight at *London*. Hence it will be easy, by a Trigonometrical Process, to obtain the visible Altitude and Azimuth of the Meteor at either of its Explosions, as seen from any Place whose Longitude and Latitude is known; and from the Time given, the Points in the Sphere of Stars answering to those Azimuths and Altitudes are readily deduced. Let those that contend for a much less height of this



Meteor try if they can on such their Supposition reconcile the several *Phænomena* before recited with one another, and with the Observation of the Reverend Mr. *William Ella*, Rector of *Bampton* in *Nottinghamshire*, between *Gainsborough* and *Redford*, which for its Exactness I must not omit. Here at 8h 5' the Meteor was seen to pass precisely in the middle between *Sirius* and the Fore-Foot of *Canis major*, moving obliquely to the Southward, in a Line whose Direction seem'd to be from the middle between the two Shoulders of *Orion*. The Latitude of the place being nearly  $53^{\circ}. 20'$ , and Longitude *West* from *London*  $0^{\circ}. 45'$ . Let them try how they can account for its being five Degrees high at *Aberdeen* in *Scotland*, and near as much at *Peterhead* half a Degree more Northerly : and then they will be better able to judge whether it did not exceed the reputed Limits of our Atmosphere. Lastly, if the apparent Altitude of the Meteor at *Paris* was not  $5\frac{1}{2}$  but  $11$  gr. on the W. by N. Point, when it must have been in its greatest Lustre, there will be no Pretence to bring it lower than I have made it, especially if it be allowed to have follow'd the Track I have assign'd it, over *Prestain*, *Cardiff*, *Minehead*, *Tiverton*, and *Brest* in *Bretany*.

Allowing this to have been the Path it mov'd in, it would be easy to assign the real Magnitude and Velocity of this Meteor, if the several Accounts of its apparent Diameter, and of the Time of its Passage from one of its Explosions to the other, were consistent with themselves. But some of them making its visible Appearance nearly equal to the Sun, which in the Opinion of many it far exceeded, we may suppose with the least, that at the Time when it first broke out over *Tiverton*, its Diameter was half a Degree, And its Horizontal Distance being 150 Geogr. Miles from *London*, and its Altitude 60, the Hypothenusal or real Distance from the Eye will be more than 160 such Miles; to which Radius the Subtense of half a Degree will be above an *Englist* Mile and half, being about 2800 Yards *quamproxime*. After the same manner it is difficult to assign its due Velocity, whilst some make it half, others less than a quarter of a Minute, in passing from its first Explosion to its last Extinction : But the distance it moved in that time being about 3 gr. or 180 Geogr. Miles, we may modestly compute it to have run above 300 such Miles in a Minute; which is a Swiftneſs wholly incredible, and such, that if a heavy Body were projected horizontally with the same, it would not descend by its Gravity to the Earth, but would rather fly off, and move round its Center in a perpetual Orb, resembling that of the *Moon*.

Of several Accidents that were reported to have attended its Passage, many were the Effect of pure Fancy; such as the hearing it hiss as it went along, as if it had been very near at hand : others imagined they felt the Warmth of its Beams; and some there were that thought, at least wrote, that they were scalded by it. But what is certain, and no way to be disputed; is the wonderful Noise that follow'd its Explosion. All Accounts from *Devon* and *Cornwal* and the neighbouring Counties



Counties are unanimous, that there was heard there, as it were a Report of a very great Cannon, or rather of a Broadside, at some distance, which was soon follow'd by a rattling Noise, as if many Small-Arms had been promiscuously discharged. What was peculiar to this Sound was, that it was attended with an uncommon Tremour of the Air, and every where in those Counties, very sensibly shook the Glass-Windows and Doors in the Houses, and according to some, even the Houses themselves, beyond the usual Effect of Cannon, though near; and Mr. *Crumys* at *Tiverton*, on this Occasion, lost a Looking-Glass, that being loose in its Frame, fell out on the Shock, and was broken. Nor do we yet know the Extent of this prodigious Sound, which was heard, against the then Easterly Wind, in the Neighbourhood of *London*, as I am inform'd; and by the Learned Dr. *Tabor*, who distinctly heard it beyond *Lewis* in *Suffex*: So that I cannot help thinking, that such a Meteor as this might have occasion'd that famous Ode of *Horace*: *Parcus Deorum cultor*, &c.

----- *Namque Diespiter,*  
*Ignem corusco nubila dividens*  
*Plerumque, per purum tonantes*  
*Egit equos volucremque currum,*  
*Quo bruta tellus, &c. Concutitur.*-----

But whether the Report heard near *Lewis* were of that Explosion right over *Devonshire*, or rather of that latter, and much greater at the Extinction over *Britany*, I shall not undertake to determine, till we have some further Accounts from *France*, whence hitherto we have only had, that at *Paris* the Time of the Appearance was at 17 Minutes past Eight.

It remains to attempt something towards a Solution of the uncommon Phenomena of this Meteor; and by comparing them with things more familiar to us, to shew at least how they might possibly be effected. And first the unusual and continu'd Heats of the last Summer in these Parts of the World, may well be suppos'd to have excited an extraordinary Quantity of Vapour of all sorts; of which the aqueous and most others, soon condens'd by Cold, and wanting a certain Degree of Specifick Gravity in the Air to buoy them up, ascend but to a small Height, and are quickly returned in Rain, Dews, &c. whereas the inflammable sulphureous Vapours, by an innate Levity, have a sort of *Vis centrifuga*, and not only have no need of the Air to support them, but being agitated by Heat, will ascend in *Vacuo Boileano*, and sublime to the top of the Receiver, when most other Fumes fall instantly down, and lie like Water at the bottom; the Experiment whereof was first shewn me by the Reverend Mr. *Whitehead* at *Oxford*, and was very lately made before the *Royal Society*. By this we may comprehend how the matter of the Meteor might have been raised from a large Tract of the Earth's Surface, and ascend far above the reputed Limits of the



Atmosphere; where, being disengaged from all other Particles, by that principle of Nature that congregates *Homogenia*, visible in so many Instances, its Atoms might in length of time coalesce and run together, as we see Salts shoot in Water; and gradually contracting themselves into a narrow Compass, might lie like a Train of *Gunpowder* in the *Ether*, till catching fire by some internal Ferment, as we find the Damps in Mines frequently do, the Flame would be communicated to its continued parts, and so run on like a Train fir'd.

This may explain how it came to move with so unconceivable a Velocity; for if a continu'd Train of Powder were no bigger than a Barrel, it is not easy to say how very fast the Fire would fly alongst it; much less can we imagine the Rapidity of the Accension of these more inflammable Vapours, lying in a Train of so vast a Thickness. If this were the Case, as it is highly probable, it was not a Globe of Fire that ran along, but a successive kindling of new Matter: and as some parts the Earth might emit these Vapours more copiously than others, this Train might, in some parts thereof, be much denser and bigger than in others, which might occasion several smaller Explosions, as the Fire ran along it, besides the great ones which were like the blowing up of Magazines. Thus we may account for the rattling Noise like Small-Arms, heard after the great Bounce on the Explosion over *Tiverton*; the Continuance of which for some time, argues that the Sound thereof came from Distances that encreased.

What may be said to the Propagation of the Sound through a *Medium*, according to the receiv'd Theory of the Air above 300000 times rarer than what we breath, and as I said before, next to a *Vacuum*, I must confess I know not. Hitherto we have concluded the Air to be the Vehicle of Sound; and in our artificial *Vacuum* we find it greatly diminished: but we have this only Instance of the Effect of an Explosion of a Mile or two Diameter, the Immensity of which may perhaps compensate the extream Fineness of the *Medium*.

*Of nocturnal Exhalations in the Indies, by Fa. Bourzes, n. 337. p. 235.* XXXI. Exhalations in the Night make a Tract of Light in the *Indies* much larger than in *Europe*. I have seen 2 or 3 that I should have taken for real Rockets: They appear'd near the Earth, and cast a Light like that of the Moon, some Days after her Change. They fall slowly, and in falling make a Curve Line; especially one which I saw on the Main-Ocean, at a great Distance off at Sea, on the Coast of *Malabar*.

*A Fiery Meteor in Jamaica, with some Physical Remarks on that Island, by Mr. Barham, n. 357. p. 227.* XXXII. About 1700, as I was riding one Morning from my Habitation, situated about three Miles North-West from *St. Jago de la Vega*: I saw a Ball of Fire, appearing to me of the Bigness of a Bomb, swiftly falling down with a great Blaze. As I thought, it fell into the Town, but when I came within a quarter of a Mile of the Town, I saw many People gather'd together a little to the Southward in the *Savanna*, to whom I rode up, where they were admiring at the Ground's being strangely



strangely broke and plough'd in by a Ball of Fire, which, as they said, fell down there. I observed many Holes in the Ground, one in the middle, of the Bigness of a Man's Skull, and five or six smaller Holes round about it, of the Bigness of a Man's Fist, and so deep (especially the biggest) as not to be fathom'd by what long Switches or Sticks they had at hand. I did not hear that any was so curious as to make any farther Search: It was observ'd, that the green Grass, was perfectly burnt near the Holes, and a strong Smell of Sulphur remain'd thereabouts for a good while after.

Note that we had a terrible rainy Night before, with much Lightning and great Thunder-Claps, which we have very frequently in *Jamaica*, often killing Cattle in the Fields. Mr. *Henry Lord*, who lives at *Dry-River*, had two Sons (big Boys) struck dead with Lightning, in 1716, without any Wounds or Appearance of Hurt found about them. And as these Claps are much louder and stronger than any I ever heard in *Europe*, so are our Showers of Rain, pouring down in a most violent manner. We have Lightning all the Year round, but our great Rains are in the Months of *May*, *August*, and *October*. I knew *May* for two or three Years without Rain, which was lookt upon as a great Wonder; and we paid dear for it in our *Indigo*; for a Caterpillar appear'd and wove a fine Silk about the *Indigo-Plant*, and destroy'd it all, hurting nothing else. *May* Rains us'd to destroy these Worms. *August* and *October* never go out without a Flood, we having then universal Rains all over the Island, coming from the Sea: For we have often Rains in the Mountains from the Clouds lodging there, when we have none in the Lowlands.

Our Island is full of Mines, and if search'd into, I question not but very rich. We are very subject to Earthquakes, several happening every Year, especially after great Rains, which fill up all our great Cracks in the Surface of the Earth: For in very dry Time, we have them so very large, deep, and gaping so open and wide, that it is dangerous to ride over some Parts of the *Savannas*, for fear a Horse should get his Legs into them. Our Earthquakes make a Noise or Rumbling in the Earth before we feel the Shake; and seem to run swiftly to the Westward.

XXXIII. An ingenious Gent. being about *Christmas* 1710. at *Glapwell-Hall* in *Derbyshire*, and walking towards *Patterson Green*, about 8 in the Evening, observ'd with great Satisfaction the Bow the Moon had fixt in the Clouds: She had then past her Full about 24 Hours: the Evening had been rainy, but the Clouds were now dispers'd, and the Moon shone pretty clear. This *Iris* had all the Colours of the *Iris Solaris* exceeding pleasant, distinct and grateful to look on, only faint, comparatively to those we see in the Day; as must necessarily follow both from the different Beams that cause it, and the Disposition of the *Medium*. The Largeness of the Arc was not so much less than that of the Sun,

*A Lunar Rainbow in Derbyshire, by Mr. Thoresby, n. 331. p. 320.*



Sun, as the different Dimensions of their Bodies, and their respective Distances from the Earth, seem to require. But as to its Entireness and Beauty of its Colour, 'twas admirable and surprizing. It continu'd about 10 Minutes before the Interposition of a Cloud hinder'd his further Observation.

*Of Marine Iris's*  
*by F. Bourzes,*  
*n. 337. p. 235.* XXXIV. The Sea was very much tost, and the Wind coming off the tops of the Waves, made a kind of Rain, in which the Rays of the Sun painted the Colours of a Rainbow. 'Tis true, the common *Iris* has that advantage over ours, that its Colours are more lively, distinct and of longer Extent. In the Marine *Iris*, we could distinguish only two Colours; a dark yellow on that side next the Sun; and a pale Green on the opposite side: The other Colours were too faint to be distinguish'd. But these *Iris's* are in a greater number; one may see 20 or 30 together, they appear at Noon-day, and in a Position opposite to that of the common Rainbow, that is to say, the Curve is turn'd as it were towards the bottom of the Sea.

*A Storm of Thunder and Lightning by Mr. Thoresby,*  
*n. 331. p. 320.* XXXV. The beginning of December 1710. was remarkable in *Yorkshire*, for such Thunder and Lightnings, as are not common at that time of the Year; particularly the Evening of the 5th Day, and the Morning of that Day Sevensnight; when *John Sainor* of *Bramham* Gardner, and two Women, designing early for Market, were so furiously encountred, that the Females took up at the first House they came at; but he proceeded on his Journey, tho' the Lightning was so severe, as he was riding over *Bramham-Moor*, that he thought his Hair had been burnt, and Face scorch'd, at one Flash; which being more severe than the rest, did actually set on Fire the Stick he had in his Hand, as he was ready to depose upon Oath. It yet retains part of the Blackness, tho' the Man had beat off much of the end of the Rod (little minding it as a Curiosity) by forcing the Horse forward, to get the sooner out of the fiery Incalcescence.

*Another in Monmouthshire, by Mr. Lhwyd,*  
*n. 334. p. 469.* XXXVI. We had at *Ponty Pool* June 6. 1697. an extraordinary Shower of Hail; which extended about a Mile, and lasted near half an Hour. It broke down the Stalks of all the Beans and Wheat within that Circumference; and ruin'd as much Glass at Major *Hanbury's* House, as cost 4 *l.* the repairing. Some of the Hail were 8 Inches about; as to their Figure very irregular: several of the Hail Stones being compounded as the Major judg'd who saw them.

*Strange Effects of a Storm of Thunder and Lightning in Ireland, com. by Sam. Molyneux,*  
*Esq; n. 313. p. 36.* XXXVII. When I went to wait upon Mrs. *Close* at her House at *New Forge* in the County of *Down*, about a Fortnight after, to inform my self in all the Particulars of this extraordinary Accident, she then told me, That Aug. 9. 1707. was close, hot, and sultry, little or no Wind stirring until towards the Evening; that there was a small Breeze



Breeze with some mizling Rain, which lasted about an Hour; That as the Air darkned after Sun-set, she saw several faint Flashes of Lightning, and heard some Thunder Claps at a distance; that between ten and eleven a Clock both were very violent and terrible, and so increased and came on more frequent until a little before twelve a Clock; that one Flash of Lightning and Clap of Thunder came both at the same time louder and more dreadful than all the rest, which as she thought, shook and inflamed the whole House; and being sensible at that Instant of a violent strong sulphureous Smell in her Chamber, which she did not perceive before now, and feeling a thick gross Dust falling on her Hands and Face, as she lay in Bed, she concluded no less than that part of her House was thrown down by the Thunder, or set on Fire by the Lightning; that arising in this Fright, she called up her Family, and Candles being lighted, she found her Bed-chamber full of Smoak and Dust, as also the Kitchen that was beneath it: The rest of the House being safe, she was not solicitous at that time about any other Damage she might have sustained, more than that she observed the Looking-glass that hung in her Chamber to be broken.

The next Day again, she found upon further Search and Inquiry, That part of the Top or Cornish of the Chimney, which stood without that Gabel-end of the House where her Chamber was, was struck off; that part of the Copeing of the Splay of the Gabel-end it self was broken down, and the Shingles on the Roof adjoyning thereto (to the number of 12 or 16) were raised or ruffled, but none shatter'd or carry'd away; that part of the Ceiling in her Chamber beneath those Shingles was forced down, and part of the Plaister and Pinning Stones of the adjoyning Wall, was also broken off and loosened, the whole Breach 16 or 20 Inches broad. That at this place there was left on the Wall a smutty Scar or Trace, as if made black by the Smoak of a Candle, which was directed downwards towards another place on the same Wall whereon a Breach was also made as the former, and of the same Dimensions, part of which was behind the place where the Looking-glass did hang; that the Boards on the back of a large hair Trunk full of Table and other Linnen, standing beneath the Looking-Glass, were forced in, and splinter'd as if by the Blow of a Smith's Sledge: That two parts of three of the Linnen within this Trunk were pierced or cut through, the Cut appearing of a Quadrangular Figure, and between two or three Inches over; that the end of the Trunk was likewise forced out, as the Back was drove in; that at about two Foot distance from the end of this Trunk (where the Floor and the Side Wall of the House joyn'd) there was a small Breach made in the Plaister, where a small Chink or Crevice was to be seen between the side Board of the Floor and the Wall, and so wide as that a Man could thrust his Fingers down; and that just beneath this again in the Kitchen the Ceiling was forced down, and some of the Lime or Plaister of the Wall broke off; that exactly under this again stood a large Tub or Vessel of Wood inclosed  
with



Plate 4. Fig. 1.

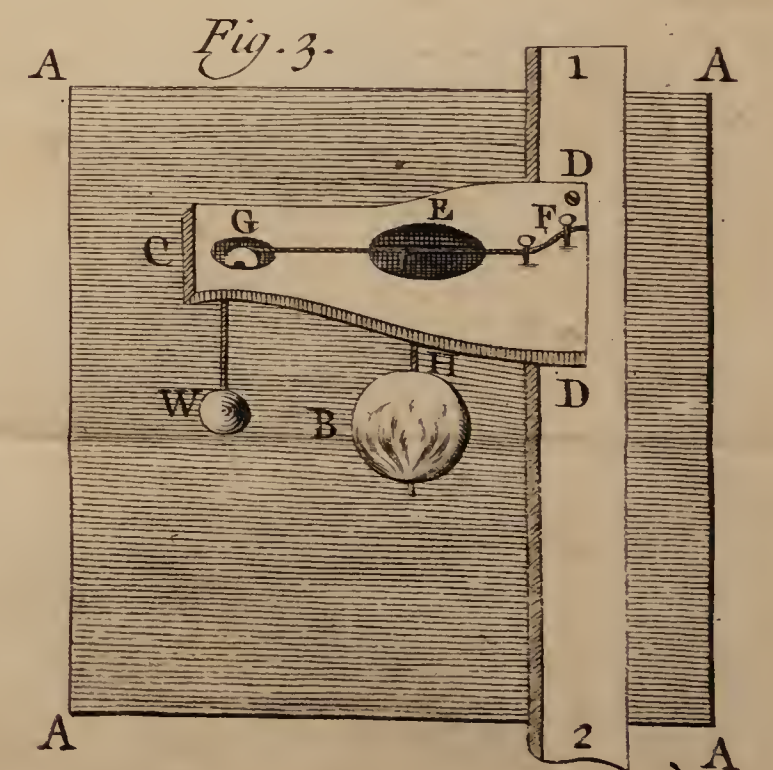
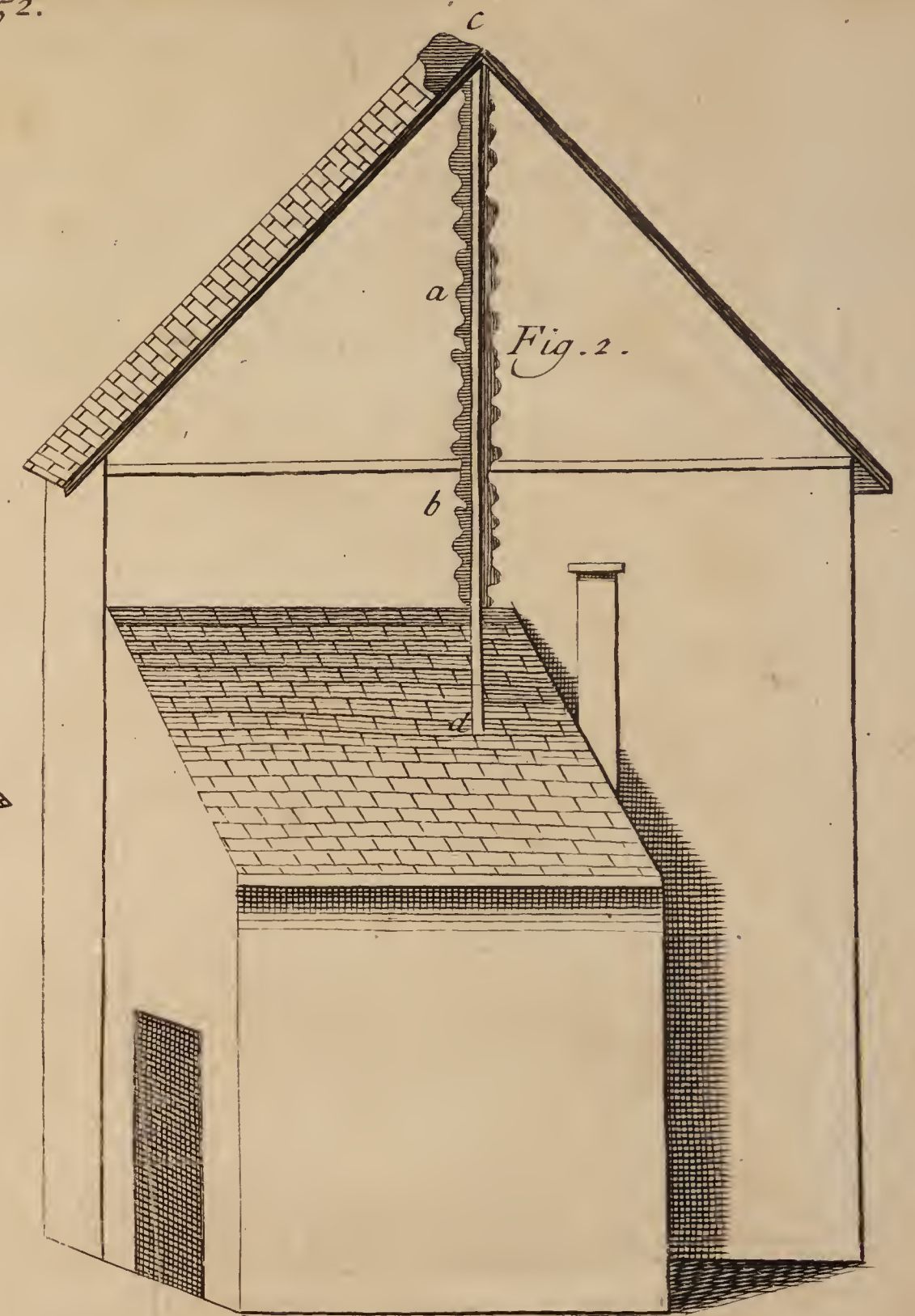
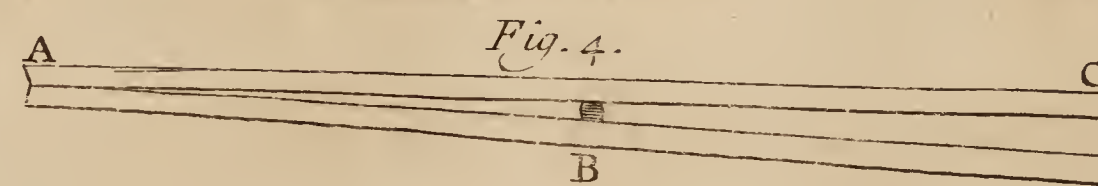
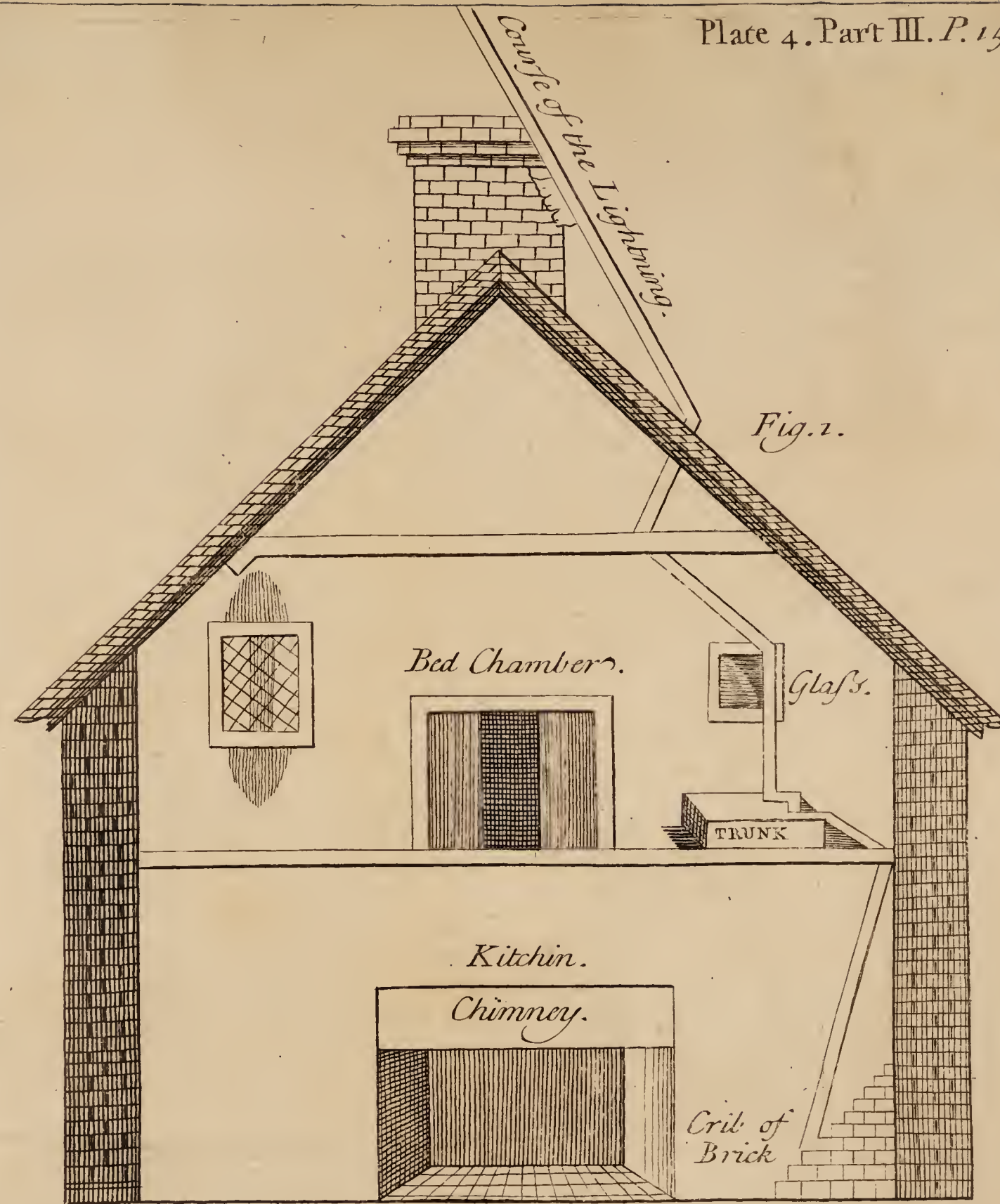
with a Crib made of Brick and Lime, which was broke and splinter'd all to pieces, and most of the Brick and Lime Work about it forced and scattered about the Kitchen. As the Gentlewoman gave me this Account, I went from place to place viewing each Particular; and as I found all was done on or near the Gabel-end of the House, I have endeavour'd to explain this Description by a Draught thereof, wherein the several Breaches are distinguished: And as I conceived all to be effected by some irresistible Body, I have also by two Parallel Lines traced out its irregular Motion.

The further material Circumstances are: That the Looking-glass was broke with that Violence, that there was not a piece of it to be found of the largeness of Half a Crown; that several pieces of it were sticking like Hail-shot in the Chamber-door (being of Oak) and on the other side of the Room: That several of the Edges and Corners of some of the pieces of the broken Glass were tinged of a light flame-colour, as if heated in the Fire: That the Curtains of the Bed were cut in several pieces, thought to be done by the pieces of Glass: That several pieces of Muslin and wearing Linnen, left (on going to Bed) by this Gentlewoman and her Daughter on the Hair Trunk, were thrown and scatter'd about the Room, no way singed or scorched; and yet this Hair on the Back of the Trunk, where the Breach was made, was sing'd; That the uppermost part of the Linnen within the Trunk was safe and well, and the lowermost Parcel, consisting of 350 odd Ply of Linnen, pierced through, of which none was any way smutted, but the uppermost Ply of a Tablecloth that lay above all the rest. The Gentlewoman told me, there was a yellow Singe or Stain perceivable on some part of the other Linnen so damaged the next Day; and that the whole Linnen smelt strong of Sulphur; but neither this yellow Stain or Smell was perceivable when I was there: That the Glass of two Windows in the Bed-Chamber above, and two Windows in the Kitchen beneath, was so shattered, that there was scarce one whole Pane left in any of them; That the Pewter, Brasses, and Iron Furniture in the Kitchen were thrown down, and scatter'd about the Kitchen, particularly a large Girdle about 20 Pounds weight, that hung upon an Iron Hook near the Ceiling, was found lying on the Floor; that a Cat was found dead the next Morning in the Kitchen, with its Legs extended as in a going Posture, in the middle of the Floor, with no other Sign of being hurt, than that the Furr was singed a little about the setting on of the Tail.

I must further remark, That the Wall both above and below a little Window in the same Gabel-end was so shattered at the same time, that the Light could be seen through the Crevices in the Wall; and that upon a large Stone on the outside of the Wall beneath this Window, was to be seen a mark, as if made by the stroke of a Smith's Sledge or large Iron Crow, with which a Splinter or piece of the Stone was broken off of some Pounds weight. I was further informed, That from the

time











time of that great Thunder clap, both the Thunder and Lightning diminish'd gradually, so that in an Hour's time all was still and quiet again.

XXXVIII. 1. There happen'd at *Ipswich*, July 16. 1708. a most violent *A Storm of Thunder and Lightning*, the Effects of which have been both wonderful and dismal; it began about Six to be perceived at some distance, and arose in the South West: I happened then to be on the highest Eminence about this Town, from whence I could very plainly distinguish the working of the Storm, and can't but take notice to you of one thing I thought very remarkable, and what I had never met with before; I judg'd it then to be about four Miles distance from me; The Instant I perceiv'd the Flash, it seem'd to extend it self like a Bow, and cast its Light a considerable way round it, and the Shaft of Lightning (if I may so call it) did not run in a waving Angular Figure as usual, but in a strait Shaft of Fire, like the Fuze of a Bomb, directly from the Cloud to the Ground; upon which, and finding the Storm approach, I hastned home, which was not a Mile. Soon after, we had two or three of the greatest Flashes of Lightning; and the noise of Thunder that succeeded them was so very great, and caused so great an Emotion in the Air, that it made the Rooms shake, and the Windows rattle, as in a great Storm of Wind. Dr. *Dade* a Physician, and very ingenious Gentleman, assured, As he came from his House to me just at that time, the Lightning seemed to dwell some considerable space on the Ground, and that he could very plainly feel the heat of it in his Face. The Passage-Boat was at that time, coming from *Harmwich*, and just got to the Town or very near, when came a terrible Flash, which killed the Master and three Persons more that were on Board. I saw one the next Day that underwent that dismal Fate, he had a Wound in his Thigh, his Breast was lacerated as if he had been whip'd with Wires, and his Face and Body as black as if he had been blown up with Gunpowder, and thousands of small black Spots about him. The Master of the Vessel was not at all disfigured, but had one Wound of his Side like a fresh Burn, and no other Mark about him, save the Chain of his Watch was melted, and no harm nor burn could be perceived on his Breeches or Cloaths. The third Person, who was a Servant, was very much torn and shatter'd about the Head, the Crown of his Hat was taken clear out, as if it had been cut out, and several Parcels of his Hair drove into the Substance of the Hat. The fourth was very little disfigured, only a black Spot on his Side, and a small Wound, as if made with a Cauterising Iron: there were several others abroad wounded and stunn'd. One *Artis*, among the former, had his Hair burnt close to his Head behind, and his Peruke untouch'd; he had a Scratch on his Arm about 4 Inches long, and a small hurt below the Elbow; he fell that Night into a violent Fever, grew delirious, and if not dead yet, is pronounced irrecoverable; whether he received any



hurt on his Brain, or the Violence of the Fever causes the Delirium, remains undetermined; there was no mark to be seen on his Coat, Waistcoat, or Shirt, where he had his hurt on his Arm. Two of the Persons killed were on the outside, and the other two under the Tilt of the Boat; and what is pretty remarkable, the two that were within the Tilt, fate on each Hand of a Woman that received no Damage: one Person had the Sole of his Shooe unripped from the Leather, and no other Damage. There was another Boat that followed them, and received no Damage, and took out the rest of the poor frightened Wretches; the Master of which does affirm, he saw the Fire light on the Bowsprit of the former Boat, where meeting a small Resistance, it flew into small Streams like a Rocket, part into the Boat, part into the Water; which if true, no doubt was the cause of the Mischief being done in so many different Parts of the Boat, whoever was unfortunate enough to be in the way of those fiery Darts, being the Sufferers.

*Its Effects at  
Colchester,  
ib. p. 140.*

*Plate 4. Fig 2.*

*† v. supr. p 152.*

2. On July 16. 1708. *die Veneris* about Eight of the Clock at Night (the greater part of the Afternoon being Cloudy, but more thick toward Night, with Thunder at a distance for above an Hour before, and much Lightning) I heard a Thunder-Crack so loud, as if it were close to me, (the like I never heard before;) at which time the Thunder and Lightning broke into a House in *Colchester*, beginning at the South side thereof at the Gable-end, breaking several Roof-Tiles, and near twenty other, as at *c*, continuing its Course Perpendicular, and in a strait Line (the only Motion that seems consistent with such Violence, which it seems was otherwise in the Gentlewoman's † House in *Ireland*) it went into a Lean-to, and lighting on a bunching out of the Wall at *d*, it entered into the Strong-Beer-Buttery through the Laths, and forced a Cork out of the lower Tap-hole of a Butt, to the Loss of some Gallons of Beer; in its way at *a*, it shiver'd a Stud about three Inches Square, so that one side remain'd nail'd to Laths, yet not much thicker than a Lath, and also brake it in two as if it were a Tobacco-Pipe. Below the Beam at *b*, it clave or split a Stud, about 4 Inches square, several Foot down, which is there standing; this was from its violent razing on the outside. At the time of this Blow Mr. King the Master of the House was in the Lean-too, and thought he should have been destroyed with the Lightning, but received no hurt; he smelt a strong sulphurous Scent. It cast the broken Wall divers Rood with the Violence. There was some little damage done to *Alballows Church* about the same time in the said Town. But that which was most lamentable, divers Boats were carrying Persons from *Harwich* to *Ipswich* on the *Orwell*; the Violence of the Thunder and Lightning killed four dead immediately, made a Lad run Mad, and wounded the rest that were in that Boat, which were twelve Persons, and melted a Watch and the Chain all of a Lump, which was in a Dead Man's Pocket; this was about the same time of the aforementioned.

This



This was about 18 Miles N. E. of Colchester, and one Mile S. E. it was no more violent than an ordinary Storm.

XXXIX. The more immediate occasion of this is to acquaint you with some of the Effects of a late Storm of Thunder and Lightning, and violent Rain, which happened August 5. 1708. I was at the Spaw at Harrow-gate near Knaresbrough; where having a spacious View upon the open Forrest, I observed the Motion of the Clouds and Storm, which began in the West, wheeling about by the North and East to the South: When the Night drew on, the Lightning must of necessity appear more dreadful. The Intermission betwixt the Flashes was very small; the Claps of Thunder were so very loud, and the Lightning sometimes so continued, that Persons were generally apprehensive of some Damage, though the more surprizing Effect of the Storm was by the Rain, as will appear by the Sequel. But first as to the Lightning; It burnt down a Barn near Scarbrough: but I shall confine my self to those parts where I was, which I have attested under the Minister's Hand Mr. Thomas Furnis of Bewerly near Pately-Bridge, about six Miles from Ripley; who writes, That Thomas Horner, with others, flying from the Violence of the Rain, which seem'd rather to fall in Spouts than Drops, took shelter in a neighbouring Barn; whence, after several frightful Thunder-claps, they were expelled by the Bolt, as they term'd it, but really the Lightning; which singed his Hair, blew another Man backward who was climbing up the Hay-Mow, left a sulphurous Stench behind it, and in the Conclusion, burnt the Barn and Hay. As to the Inundation it was surprizing; it tore up much of the Road and Street from the Church to the Bridge, and made Pits in some places several Yards deep, threw down part of a Barn and Stable, both of them lately built, it push'd into most of the Houses in the Town; the Water in some was as high as the Soles of the Windows, and block'd up the Door of one House with Gravel almost to the very top; and if it had continu'd with that Violence half an Hour longer, most of the Town had been in the utmost danger: Several Persons were in great danger, but only one Woman drown'd; she was hurry'd away with the Violence of the Stream, and not found till the 4th Day after: It removed the Bole of a large Oak (now sold for about 4 Nobles) several Yards; bore down the most part of 4 Wood Bridges; and has left at the end of the great Stone Bridge, or within about 100 Yards of it, as much Gravel, &c. as is computed at above a thousand Cart Loads: One Neighbour gives Ten Pounds for removing the Stones and Gravel left in a small Tract of Ground.

XL. Upon Tuesday, the 16th Day of July 1706, about eight a Clock in the Morning, it began to rain in and about Denbigh, which continued incessantly for 30 Hours, but not very violently, till about three or four a Clock in the Morning upon Wednesday, when it rain'd somewhat faster, attended with a terrible noise (like Thunder) with



some Flashes of Lightning, and a boisterous Wind. About break of Day the Rain and Wind began to abate of their Violence, which lessened gradually every Hour, till about one or two a Clock in the Afternoon, and then it perfectly ceased, and the Air became clear and somewhat calm. Upon *Tuesday* the Wind blew South West, but on *Wednesday* it was come to the North West.

The Effects of this great Storm were dismal, for it occasioned the overflowing of all the Rivers in *Denbighshire*, *Flintshire* and *Merionethshire*, &c. which spoiled a great deal of Corn, and took off all the Hay that was mowed, near the Banks of the Rivers, which was carried by the Stream in such vast Quantities down to the Bridges, that it choakt the Arches and Inlets, inso much that it broke down above a dozen great Bridges, the rebuilding of which in the three Counties above-mentioned is valued at some Thousands of Pounds. Great Oaks and other large Trees were unrooted and swept away, with several Quickset Hedges; and some Quillets by the side of the River *Elwy*, so cover'd with Stones and Gravel, that the Owners can't well tell whereabouts their Hedges and Landmarks stood; and the same River has alter'd its course in some Places, so as to rob the Landlords on one side of some Acres, and bestowed as much on the opposite side. Two or three Rivulets, that convey'd Water to some Mills, have been so choakt up with Stones and Gravel, that the Owners don't think the Profit will countervail the great Charge of clearing them.

It is affirmed by a great many People, that the great Floods were not so much the Effects of the Rain, as the breaking out of an infinite number of Springs, in such Places, as they were never known to flow from before. In the Town of *Denbigh*, a great many broke out in the Houses and Stables, especially in that part which lies next the Castle on the North side of it; some of which broke out with a great deal of Violence, and in such a quantity, that it is affirmed by several of the Town, three of these new Springs were sufficient to turn any Corn Mill.

At a small distance, Northward of *Denbigh*, lies *Park-Snodiog*, a Rocky Hill, out of which broke out a great many Springs, which flowed so plentifully for nine or ten Days, that the Cattel water'd in them for that time; whereas before and after, the People were forc'd to water them all Summer long at a Well in the High-way, at some distance from this *Park-Snodiog*. There are several deep Holes and Trenches cut in the High-ways adjoyning to the River *Elwy*, &c. some so very large, as to hide 3 or 4 Horses, which is not attributed so much to the overflowing of the River, as to the breaking out of Springs in those very places.

In *Comb* Mountain there is a Pit of a circular Form, which in the Summer time used to have little or no Water in it, and in Winter, as much Water as would swell the Surface to about fourteen or sixteen Yards cross over: But now in the midst of Summer it rose up at least a Yard and a half higher than it was ever known to do in the wettest Winters; and overflowing its Banks, it fell down the Hill with such Violence,

as



as to penetrate into the very body of a rocky Road, and dug Pits in it, that will bury the biggest Horses, and the Road which was a common Highway, is now become irreparable.

XLI. A Storm of Hail; accompanied with very terrible Thunder and Lightning begun *June 7. 1711.* about *Rotheram*, (a little beyond which was somewhat of an Hurricane) where it burnt a noted Tree. About one of the Clock it reached *Wentworth-Woodhouse*. The Hail-Stones were from 3 to 5 Inches in Circumference, and some say larger; which killed several Pidgeons; but the chief Damage done here, was in the Glass Windows, which cost Forty Pounds in repairing. In *Wash* Field, about two Miles from thence, it did vast Damage. This Field is generally computed to be worth a Thousand Pounds when in white Corn (to use the Countryman's Expression :) Some part of it escaped, and the Barley received no Damage; but the generality of the Wheat was cut off, about half a Yard from the Ground, and the Rye about two Foot. The Stubble, though green at first, turn'd white, that it look'd like a Field newly Shorn. The Rye was afterwards Mown instead of Shearing, and yielded not above a Bushel of Corn in a Wain-load. Some of the Wheat took Root, and grew up; but the Husbandmen generally thought, that if it should come to Perfection, it would scarce yield as much as would be Seed for another Year. The breadth of this Storm was about half a Mile, as appeared by the Effects. In Places adjoyning there was no Hail, but large drops of Rain. A Joiner measured one of the Hail-Stones with his Compasses, and it was an Inch and half in length: But these were not globular, but mostly oblong. The generality of them there (which was at *Bolton super Dearne*) were of the bigness of ordinary Cherries; though the aforesaid Minister's Son took up one that was an Inch and a half in Diameter and round, not long, and somewhat flat, as the others were; but the Youth durst not stay long out, the Hail fell with such Violence. Ten of his Pidgeons were brought in fore wounded, though not quite dead. Great quantities of Twigs and small Boughs were beaten off the Trees, which being of less Moment are omitted; but the Damage in the Corn was severe upon the poorer sort of Inhabitants.

*A Storm of Hail by Mr. Thoresby, n. 335. p. 514.*

XLII. In the Parish of *Sampford-Courtney* near *Oakhampton* in *Devon*, *Octob. 7. 1711.* about 3 or 4 a Clock in the Afternoon, there was a great Darknes as the Minister was Catechizing the Children, that he could hardly see with Spectacles: And as soon as Prayers were over, some young Men went to ringing, as commonly they used to do; and there were several People in the Church Porch talking; and of a sudden, a great Fire-Ball fell in between them, and threw some one way, some another, but no one was hurt. The Ringers said, they never knew the Bells go so heavy in all their Lives, and were forced to leave off: And being very weary, and looking out of the Belfrey into the Church

*A Storm of Thunder and Lightning, com. by John Chamberlayne, Esq; n. 336. p. 528.*



Church, saw Four Fire-Balls more, a little bigger than a Man's Fist, which of a sudden broke to pieces; so that the Church was full of Fire and Smoak. A Man received a full Blow in the Neck, which caused him to bleed both at Nose and Mouth; but is very well now. He says, that the Fire and Smoak went up into the Tower, which broke a great Beam which one of the Bells hung on, and the Gudging breaking, the Bell fell on the Floor. It likewise carried away one of the Pinacles of the Tower next the Town, and threw some of the Stones near a Barn Door at a pretty distance from the Church, and hath done some Damage to the Barn at one end. The Chimney of the House was remov'd in such a manner by the Thunder and Lightning, that all People admir'd it stood, and did not fall upon the House. And though the People ran about in great Consternation, no body was hurt. This Relation comes from the Minister who officiated.

Of the Luminous Qualities of Amber, Diamonds and Gum Lac, by Dr. VVall, in 314. p. 69.

XLIII. You may remember my telling you many Years ago, of my good Friend Mr. Boyle's communicating to me, about the Year 1680, his way of making the *Phosphorus* with Urine, at the same time desiring me to use all my Endeavours to find out some other Subject, from whence it might be made in greater Quantity; and perhaps he might have made the like Request to many more: for to use his own Words, he said, He really pity'd his Chymist, who was forced to evaporate so prodigious a Quantity of Urine, to get a very little of the *Phosphorus*. Soon after, in order to see some Experiments in Chymistry, I lodg'd for a short time at his Chymist's House, one Mr. Bilgar, then living in Mary le Bone Street near Piccadilly; who indeed was equally, if not more importunate with me than Mr. Boyle, to try if I could find out some other Matter, from which more might be made than from Urine, telling me there was so great a Demand for it, that it wou'd be of very great advantage to him. It being then a very hot Summer, I caused a piece of the dry'd Matter in the Fields, where they empty the Houses of Office, to be digg'd up, in which, when broken in the Dark, a great number of small Particles of *Phosphorus* appear'd: This Matter I carry'd to Mr Boyle, who view'd it with great Satisfaction, and Mr. Bilgar, by his Direction, fell to work thereon, but from it cou'd make very little or no *Phosphorus*, till another Matter was added to it in Distillation, and then he cou'd therewith make large Quantities, to his great Profit; for while I was at his House, I often saw him make it, and sell it for six Guineas, and six *Louis d'Ors* an Ounce, whereby he got so much Money, that I believe, he thought himself above his Business, and quickly left *England*.

You well know, Sir, that humane Urine and Dung do plentifully abound with an *Oleosum* and common Salt, so that I take the Artificial *Phosphorus* to be nothing else but that Animal *Oleosum*, coagulated with



with the Mineral Acid of Spirit of Salt, which *Coagulum* is preserv'd and not dissolv'd in Water, but accended by Air.

Conjecturing therefore that *Amber*, which I take to be a Mineral *Oleofum* coagulated with a Mineral Volatile Acid, might be a natural *Phosphorus*, I fell to make many Experiments upon it, and at last found, that by gently rubbing a well polish'd piece of Amber with my Hand in the dark, which was the head of my Cane, it produc'd a Light; whereupon I got a pretty large piece of Amber, which I caused to be made long and taper, and drawing it gently through my Hand, being very dry, it afforded a considerable Light. I then us'd many Kinds of soft Animal Substances, and found none did so well as that of Wool. And now upon drawing the piece of Amber swiftly through the Woollen Cloth, and squeezing it pretty hard with my Hand, a prodigious number of little Cracklings were heard, and every one of those produc'd a little flash of Light; but when the Amber was drawn gently and slightly through the Cloath, it produc'd a Light but no Crackling; but by holding ones Finger at a little distance from the Amber, a large Crackling is produced, with a great flash of Light succeeding it; and, what to me is very surprizing, upon its Eruption it strikes the Finger very sensibly, wheresoever apply'd, with a push or puff like Wind. The Crackling is full as loud as that of Charcoal on Fire; nay, five or six Cracklings or more, according to the Quickness of placing the Finger, have been produc'd from one single Friction, Light always succeeding each of 'em. Now I make no question, but upon using a longer and larger piece of Amber, both the Cracklings and Light would be much greater, because I never yet found any Crackling from the Head of my Cane, although 'tis a pretty large one; and it seems, in some degree, to represent Thunder and Lightning; but what to me is more strange than all I have been telling you is, that though upon Friction with Wool in the day time, the Cracklings seem to be full as many and as large, yet by all the Tryals I have made, very little Light appears, tho' in the darkest Room; and the best time of making these Experiments, is when the Sun is 18 Degrees below the Horizon; and when the Sun is so, though the Moon shines never so bright, the Light is the same as in the darkest Room, which makes me chuse to call it a *Noctiluca*.

As Diamonds are Electral as well as Amber, I have made some Trials on them, and think my way of distinguishing Diamonds morally certain. A Diamond, by an easy slight Friction in the Dark, with any soft animal Substance, as the Finger, Woollen, Silk, &c. appears in its whole Body to be luminous; nay, if you keep rubbing for a little while, and then expose it to the Eye, 'twill remain so for some little time: But if the Sun be 18 Degrees below the Horizon, if any one holds up a piece of Bays or Flannel stretch'd tight between both hands, at some distance from the Eye, and another rubs the Bays or Flannel with a Diamond swiftly and pretty hard on the other side of it,



it, the Light to the Eye of him that holds it, seems much more pleasant and perfect than any other way I have yet try'd. But what to me seems more surprizing than all I have mention'd is, that a Diamond being expos'd to the open Air in view of the Sky, gives almost the same Light of it self without rubbing, as if rubb'd in a dark Room; and if in the open Air you put your hand or any thing else a little over it, to hinder its Communication with the Sky, it gives no Light: And I do assure you, I have try'd all or most of the other precious Stones, but could find no such *Phænomenon* in any of them; and I must further add, that all the Experiments here related were made at the latter end of *May* and beginning of *June*, and therefore I can't pretend to account for the *Phænomena* that may attend Experiments made while the Sun is on the other side of the *Æquator*. There are some other Bodies that afford Light, and perhaps many more remain yet undiscover'd, but I'm well assur'd, that all or most of the Bodies which have an Electricity yield Light; for in my Opinion, 'tis the Light that is in'em, which is the cause of their being Electral, yet this Electricity never shows it self without Friction; if you rub any Body that has an Electricity, and apply it near to some light Bodies, as particularly very thin Slices of Cork, 'twill put them into a great Agitation, and make them seem to the Eye as hanging at the Body by a fine Hair. Jet seems to me to be a black Amber, having most of the Properties of Amber, but not so perfect and pure.

I must not forget to speak of another Substance, which is also a natural *Phosphorus*, or *Noctiluca*, and that is *Gum Lac*, and also red Sealing-Wax, which is made with *Gum Lac* and *Cinabar*, the *Cinabar* no way impeding but rather promoting its luminous Quality, for I caus'd long taper Rolls to be made up of *Lac* alone, and of pure red Sealing Wax, both being well polish'd: The Sealing Wax upon Friction seems to me to emit its Crackling and Light sooner than the *Lac*, which I impute to the *Cinabar*'s constringing its parts, tho' I think *Lac per se* has the greatest Electricity, both having all or most of the Properties of Amber; and by all the Tryals I have hitherto made of *Lac* and Sealing Wax, I find that though the Cracklings are as plentiful in the Day time, as when the Sun is down, yet in the darkest Places I cou'd discover but a little Appearance of Light, so that this deserves the Name of a *Noctiluca* or *Phosphorus*, as well as the others already spoken of, it being no other than a Vegetable *Oleosum* coagulated with an Animal Volatile *Acidum*. I don't know in the Animal Kingdom any thing but Pismires that afford a Volatile Acid, and in the *East-Indies* there's a large kind of 'em, that live on the Sap of certain Plants, affording both a Gum and a Colour, which Sap passing through the Body of those Insects or Animals, is by their Acid Spirit converted into an Animal Nature; which is the reason that with the Colour extracted from *Gum Lac* (which *Gum Lac* is nothing else but the Excrements of these Insects or Animals) almost as good and full as lasting Colours are made as from

*Cochinele* :



*Cochinele*: After the same manner the remaining Gum, which is an *Oleosum*, being digested and passing through the Bodies of those Insects or Animals, is by their Volatile Acid converted into a Vegetable Animal *Phosphorus*, or *Noctiluca*; the artificial *Phosphorus* is a Mineral-Animal *Phosphorus*, whereas I take the others to be altogether Mineral.

XLIV. To make these Experiments accurately, I devised the following *Apparatus*, to account exactly for the time of the Bodies descending. At the Height from which the Balls were to be dropt, I fix'd a Contrivance in form of a Trough, in all about 4 Feet long, and the end of it, on which the Balls were laid, was loose, swinging on 2 Pins at the extremity of it. This loose end was supported by a thin piece of Board, which slid under it through a Groove from the other part of the Board: To this sliding Board was fix'd a String, which related to a small Wire that reach'd to the bottom of the Descent, where it (the Wire) had a Communication with a Contrivance, to give Motion to a Pendulum which beat  $\frac{1}{2}$  Seconds: Now when this sliding Board (just mention'd) was drawn from under that part of the Trough on which the Balls were placed, the String thereby became so much shorten'd, as to move the Limb of that Contrivance at bottom, which dropt the Pendulum at the same instant of time, as the Balls began to descend.

*Experiments by Mr. Hawksbee, of the Time requir'd for the Descent of different Bodies of different Magnitudes and Weights. n. 328. p 196.*

Exp. 1. The first Experiment I made, was with two Balls: One of them a thin Glafs Buble, fill'd with Quicksilver; its Diameter 8 tenths of an Inch, and its Weight 840 Grains: The other Ball was of Cork, whose Diameter was 2 Inches, 2 tenths, and its Weight 120 Grains. When these Balls were dropt, the Pendulum made 8 Vibrations, just as the Quicksilver Ball struck the Ground, and 8 more were repeated before the Cork arrived at the same place. The Pendulum vibrated  $\frac{1}{2}$  Seconds precisely.

Exp. 2. I took a Quicksilver Ball, much of the same Weight and Diameter as before: The other was a thin Glafs Buble, its Weight 493 Grains, its Diameter 4 Inches 3 10ths. For these, when they came to descend, the Pendulum made just so many Vibrations as in the last Experiment; that is, the Quicksilver Ball struck the Ground at 8 Vibrations, and the other just at the end of 16.

Exp. 3. The Quicksilver Ball that I made use of in this Experiment, was likewise much of the same Weight and Diameter as before: The other Ball was of Glafs, whose Weight was 535 Grains; its Diameter one way measur'd 5 Inches  $\frac{1}{4}$ , and its opposite Diameter but 5 Inches. Upon the Descent of these Balls, the Pendulum made but one Vibration more than in the other Experiment; that is, the Quicksilver grounded exactly at 8 Vibrations, and there were 9 more before the other Ball arrived at the same place.

These Experiments were made from the top of the Cupola of St. Paul's Church, *London*; from whence to the Floor, on which the Balls were dropt, measured near 220 Feet. It is to be observ'd, that the Quick-



silver Balls made no sensible Impression on the Floor on which they descended (which at that time was covered with Deal Boards) notwithstanding their Weight and Velocity of Descent.

The following Experiments on the Descent of Bodies in Air, were there made in the same manner.

## Quicksilver Balls.

## Large thin Glass Balls.

Weight in Gr.	Diam. 10ths of Inch.	Time of fal- ling in $\frac{1}{2}$ Seconds.	Weight. in Gr.	Diam. Inc. 10th. $\frac{1}{2}$ Second.
908	.8	8	510	5.1
993	.8	a little less	642	5.2
866	.8	8	599	5.1
747	.7 $\frac{1}{2}$	a little more.	515	5.0
808	.7 $\frac{1}{2}$	8	483	5.0
784	.7 $\frac{1}{2}$	a little more.	641	5.2

These Experiments were made June the 9th 1710. at which time the Height of the Quicksilver in the Barometer was 29.7 Inches, and the Thermometer 60 Degrees above the freezing Point. The Quicksilver Balls, and the large thin Glass Balls, were dropt together as they are ranged in their several Lines.

by  
Dr. Desagu-  
liers, n. 362.  
p. 1071.

2. I took 12 Balls (six of which were solid Leaden Globes of about two Inches Diameter; three hollow Glass Balls of about 5 Inches Diameter; and three light Pastboard hollow Globes of about the same Diameter) and having carried them to the upper Gallery in the Lanthorn, on the Dome of St. Paul's Church, I caused them to fall down by two at a time, in the following manner;

First, a Leaden Ball and a Glass Ball.

Secondly, a Leaden Ball and Glass Ball.

Thirdly, a Leaden Ball and a Glass Ball.

Then I let fall in the same manner the three other Leaden Balls, each with a Pastboard Ball.

After that, having the Leaden and Pastboard Balls brought up again, I repeated the Experiment twice more with a Leaden and Pastboard Ball: then I made the Experiment twice more with a Pastboard Ball alone, to see how long it would be in falling.

Upon the whole it appeared that the Leaden Balls were a very little longer than 4  $\frac{1}{2}$  Seconds in falling; the two largest of the Glass Balls 6 Seconds, and the Pastboard Balls 6  $\frac{1}{2}$  Seconds.

The height of the Gallery, from whence the Bodies fell, was 272 Foot above the Pavement of the Church (then cover'd with Boards) upon which they fell.



The times of the Falls were taken two ways above, viz. with a Wheel-Chronometer, which measures a small part of Time accurately, nearer than to a quarter of a Second (made and contriv'd by Mr. George Graham, an ingenious Clock-maker) and with an  $\frac{1}{2}$  Second Pendulum: And the Differences of Time between the fall of the Leaden Balls and the other Balls were taken below, by the President, *Martin Folkes*, Esq; F.R.S. and another Person, who all agreed in their Observations of the Time, which they made each with an half Second Pendulum.

Leaden Balls	Troy Weight. l. oz. d.	Diameters in Inches and Decimals.
1c	2 : 1 : $\frac{1}{2}$	2, 1
2c	1 : 11 : 4	1, 99
3c	1 : 11 : 12	2, 0
4c	1 : 11 : 12	2, 0
5c	1 : 11 : 12	2, 0
6c	1 : 10 : 0	1, 98
Pastboard Balls.		
A	0 : 3 : 6	5, 5
B	0 : 1 : 14	5, 1
C	0 : 1 : 17	5, 1
Glass Balls.		
D	0 : 3 : $13\frac{1}{2}$	3, 9
E	0 : 5 : $3\frac{1}{2}$	5, 42
F	0 : 6 : $0\frac{1}{2}$	5, 55

The Marks,  
Weights, and  
Diameters of  
the several  
Balls.

The Polar and Equatorial Diameters of the Glass Balls being different, I have set down a Mean Diameter for each of them; the true Diameters are thus, of *D* 4 and 3,8. of *E* 5,6 and 5,25. of *F* 5,7 and 5,4. Inches. The particular Experiments are as follows.

Exp. 1. Fall of 1c and *D. c* fell by the Pendulum in  $4\frac{1}{2}$ ". The Fall of *D* was so near it, that the Difference was not taken either above or below.

Exp. 2. Fall of 2c and *E. 2c* fell by the Chronometer in 5", by the Pendulum in  $4\frac{1}{2}$ ". Time of the Fall of *E* not taken above. The Difference taken below  $1\frac{3}{4}$ ".

Exp. 3. Fall of 3c and *F. 3c* fell by Chronometer in  $4\frac{1}{2}$ ", by Pendulum in  $4\frac{1}{2}$ ". *F* fell in six Seconds. Difference taken below was  $1\frac{1}{2}$ ".

Exp. 4. Fall of 4c and *A. 4c* fell by Chronometer in  $4\frac{3}{4}$ ", by Pendulum in  $4\frac{1}{2}$ ". *A* fell in  $6\frac{1}{2}$  Seconds. The Difference taken below = 2".

Exp. 5. Fall of 5c and *B.* We made no Observation above or below.

Exp. 6. Fall of 6c and *C. 6c* fell by Chronometer in  $4\frac{3}{4}$ ", by Pendulum in  $4\frac{3}{4}$ ", *C* not taken above. Difference below =  $2\frac{1}{4}$ ".



Exp. 7. Fall 1c and B. 1c fell by Chronometer in  $4\frac{3}{4}$ " by Pendulum in  $4\frac{3}{4}$ ". B not taken above. Difference taken below  $2\frac{3}{8}$ ".

Exp. 8. Fall of 5c and A. 5c fell by Pendulum in  $4\frac{3}{4}$ ". A fell foul, and so was not observ'd at all. Difference taken below 2".

Exp. 9. Fall of B alone. by the Chronometer in  $6\frac{1}{2}$ ", by the Pendulum in  $6\frac{1}{2}$ ".

Exp. 10. Fall of C. alone by the Chronometer in  $6\frac{1}{2}$ " by the Pendulum in  $6\frac{1}{2}$ ".

By Galileo's Theory, the Lead, which was  $4\frac{1}{2}$ " in falling, must fall 4 Foot the first  $\frac{1}{2}$ ", or 16 Feet the first Second, which amounts to 324 Feet in  $4\frac{1}{2}$ ". But as the Sound of the Ball (as it struck the Bottom) by which we reckon'd our Time, had 272 Feet to move, we must abate a  $\frac{1}{4}$  of a Second nearly, (supposing Sound to move one Mile in  $4\frac{1}{2}$ ") which will take away 35 Feet, that the Body must have fallen in the last  $\frac{1}{4}$  of a Second, and reduce the number of Feet to 289: so that the Lead will have only fallen 17 Feet short of the Theory, which must be attributed to the Resistance of the Air.

The large Glass Ball in the 6 Seconds of its Fall, wou'd in a *Vacuum* go through 576 Feet: but taking away the last  $\frac{1}{4}$  of a Second or 47 Feet, for Motion of Sound, it must only fall 529 Feet in *Vacuo*. Now since it fell but 272, there have been 257 Feet taken off from the Fall by the Air's Resistance.

Likewise the Pastboard Ball in  $6\frac{1}{2}$  Seconds must have fallen 676 Feet: but deducting the last quarter of a Second or 51 Feet for the Motion of the Sound, there remains only 625 Feet for its fall in *Vacuo*. But as it fell only 272 Feet, we must allow a Retardment of 353 Feet for the Resistance of the Air.

At a mean we may call the weight of the Glass Ball 5 Oz. Troy, and its Diameter 5 Inches and  $\frac{1}{2}$ ; and the weight of the Pastboard Ball 2 Ounces Troy, and a little more than 5 Inches Diameter.

The Lead Balls all fell within near a Foot of one another, and made an Impression in the Boards of about  $\frac{1}{3}$  of their Depth.

The Barometer stood at 30,1 Inches, and the Mercury was very Convex, and therefore inclined to rise still.

Having found by our former Experiments, that thin Glass Balls, and even Balls of pasted Paper, were too heavy to make so considerable a Difference between the time of their Fall, and the Fall of Leaden Balls, that it might be easily observ'd; I contriv'd a Way to make dried Hogs Bladders perfectly round, by blowing them (when moist) within a strong spherical Box of *Lignum Vitæ*, and letting them dry in the said Box before I took them out: which I did by opening the Box that I screw'd in the middle, and had a hole in the Pole of one of its Hemispheres to let the Bladder pass through, in order to tie it after blowing; and some few small Holes all over the Box, that in blowing no Air might be confin'd between the inside of the Box and the Bladder, so as to hinder it from putting on a Spherical Figure. Besides I took off the ends



ends of the *Ureters*, the Fat and a great deal of the upper Coats of the Bladders, before I blew them in the Box, to render them still lighter.

The Bladders I used were some of the thinnest I cou'd find ready blown at a *Druggists*, which I moistned in Water, taking care to leave none in the inside. I chose those rather than green ones, which in drying wou'd have stuck so fast to the inside of the Box, that it wou'd scarce have been possible to have got them out without tearing.

Having prepared five Bladders in the manner aforesaid, (which I have described the more fully to direct any body else that shou'd be willing to try the like Experiments) I took them up to the upper Gallery in the Lantern on the top of the *Cupola* in *St. Paul's Church*; and there by a Contrivance, which I shall just now describe, I let them fall by one at a time, together with a Leaden Ball of about 2 Inches Diameter, and weighing 2 *l. Troy*: and I took notice of the time of the Fall of each bladder, knowing by former Experiments that the Balls are about  $4\frac{1}{4}$  Seconds, or a little longer time, in falling the same Height, which is 272 Feet.

The following Table, consisting of five Columns, gives in the first, the Marks of the Bladders; in the next their Diameters; in the third their Weights in Grains *Troy*; in the fourth the times of their Fall in Second Minutes of time; and in the fifth, the Difference of Time between the Falls of the Leads and of each Bladder, taken below by the *President*, *Dr. Halley*, *Dr. Jurin*, *Martin Folkes*, Esq; and *Mr. George Graham* the Clock-maker. The Time was taken above with *Mr. Graham's* Chronometer, (formerly described); and below with the same Instrument, and three half Second Pendulums, all which agreed very well together.

The Experiments having been made twice over, the Table is twice set down; and those Experiments in which the Bladders fell streight down, and the most regularly, have this Mark before them (\*).

Marks.	Diameters in Inches.	Weight in Gra. Troy	Time of the whole Fall	Diff. between the Lead and Bladder.
A	5,3	128	$19\frac{3}{8}$ "	14 $\frac{2}{3}$ Seconds.
* B	5,193	156	$17\frac{1}{4}$	12 $\frac{3}{4}$
C	5,33	$137\frac{1}{2}$	$18\frac{3}{4}$	14 $\frac{5}{8}$
D	5,26	$97\frac{1}{2}$	$22\frac{1}{8}$	17 $\frac{6}{8}$
* E	5,02	$99\frac{1}{8}$	$21\frac{5}{8}$	17
<hr/>				
* A			19"	14 $\frac{1}{2}$
B			$18\frac{5}{8}$	14 $\frac{1}{4}$
* C			$18\frac{3}{8}$	14
D			24	19 $\frac{1}{8}$
E			$21\frac{1}{4}$	16 $\frac{6}{8}$



The Diameters and Weights may be relied upon, being taken the Day that the Experiments were made, and the Day after; but the Diameters and Weights taken 10 Days before not agreeing with these, I have left them out. For the Bladders by drying had lost of their Weight, and altered their Diameters.

As the Necks of the Bladders in drying shrink so as to open a little, they must be blown before each Experiment.

Plate 4. Fig. 3. *A, A, A, A*, is the Hole through which the Bodies fell. 1, 2, is a Board laid over the Hole. *G, D, D* is another Board fixt to the first Board by the two Wood Screws *D, D*, with a Pulley *G* at the other end of it, over the Hole. *W* is a two Pound Ball of Lead fastned to a strong Thread, which going over the Pulley is stretched horizontally from *G* to the Nails *F*; to which it is fastned, so as to be about a quarter of an Inch above the Board.

*B* is one of the Bladders, hanging with the Neck or heaviest part downwards, by means of a Loop of fine Thread as *EH*, which goes over the Horizontal Thread *G E F*. Now when with a pair of Scissars the Thread of the Lead (which in all is but one Foot long) is cut just at *E*, before the Loop of the Bladder, the Lead pulling away the String, the Loop of the Bladder slips off the remaining Thread *FE*, and begins to fall exactly in the same Instant as the Lead: But if the Thread should be cut between *E* and *F*, as the Lead falls, its Thread might give the Bladder an oblique Direction.

He that observes the time either with a Pendulum or Chronometer may take it very exactly, by seeing the Motion of the Scissars as they cut the Thread.

As the Diameters of the Bladders were taken by wrapping a Thread twice round them, and something must be allowed for the Thickness of the Thread; I have here under set down the Diameters of the Bladders, as corrected by that Allowance. viz. *A* 5,28 Inches; *B* 5,19; *C* 5,30; *D* 5  $\frac{1}{4}$ ; and *E* just 5 Inches in Diameter.

The Bladder *E* was rough, with several Wrinkles and Inequalities, which made it be longer in falling than it ought to have been, according to its Diameter and Weight.

A Pail of Water thrown down, met with such a Resistance in falling 272 Foot through the Air, that it was all turn'd into Drops like Rain.

Of the Effects  
of Air past  
through red hot  
Metals, and  
other hot Media,  
by Mr. Hawks-  
bee, n 328.  
p. 199.

XLV. In order to find what Effect such a Medium as Air passed thro' red hot Metals, might have on the Lives of Animals, I contrived the following Method. I took a large Receiver open at top, in Diameter about 4 inches, which was covered with a brass Plate and wet Leather, as usual in Glasses of such a make. To this Plate at top (which had a Screw with a small Perforation) belonged a Cock, and from that Cock proceeded a small hollow Wire, about 3 Feet in length: That End of this hollow Wire, which was remote from the Receiver, was put into a hollow piece of Cast Brass, pretty thick in Substance, but the Hole

was



was not quite through: And the Hole being larger than the small hollow Wire, it was wedg'd into the same with pieces of Steel Wire, till the Cast Brass was fill'd as full as it could contain. In this manner it was put into a Charcoal Fire, and there it lay till it was thoroughly red-hot. The Receiver being then exhausted of its Air, the Cock on the upper part of it was turn'd, which gave liberty for that Air only, which of necessity must pass through the red hot Metals, to succeed. This Air first passing down through the small Ducts between the red hot Wires, before it could come to enter the red hot hollow brass Wire, must of necessity suffer or undergo such a Change, as Fire or the Fumes of such red hot Metals would give it. When the Receiver was fill'd with this Air, and had stood some little time, the brass Cover was taken off, and a pretty large Cat immediately plung'd into it: The Cover being laid on again, the Cat immediately fell into Convulsions, and in less than a Minute appeared without any sign of Life. Then being taken out of the Receiver and laid on the Floor, she continued as Dead; but in less than a Minute of time she began to discover Life by Motion in her Eyes, and after 2 or 3 hideous Squalls, she began to recover apace; but was very fierce, and did spit and fly, (as well as her Weakness would suffer her) at any one that offer'd to touch her; and it seem'd hazardous for any one then to attempt it. But after half an Hours time, or thereabouts, as her Strength and Ease recovered, so her former Temper encreased upon her, suffering herself to be handled without any sign of Fierceness, as before.

As to the Effect, which the same sort of factitious Air has upon flame, take as follows.

I no sooner came to plunge a lighted Candle into it, but it was immediately extinguish'd: And this I several times observ'd, that when the Candle was slowly immers'd, so much of the Wick (which before was lighted) as came but within the verge of the Glass, died; and so the rest successively, as it descended to the same place: And this upon several Repetitions, answer'd much the same: But in some time, as the common Air came to mix with it, one might plunge the lighted Candle lower and lower, before it did go out, till at last it would remain burning at bottom.

As to the Elasticity and Specifick Gravity of the foremention'd *Medium*, I have made several Tryals, (and I think very accurate,) but find it no ways differing from Common Air, in respect to those Properties. Hence it follows,

That the foregoing Effect is no ways assisted from any Imperfection or defect in the last mentioned Properties: Therefore the following Queries seem to offer themselves. 1. Whether Air it self may so suffer in its own Nature by any sort of Fire, as to be divested of the Power of subsisting Life or Flame: Or, 2. Whether the *Effluvia*, or Steams, proceeding from the red hot Metals, which the Air may take along with it in its Passage near them, do not very much contribute, if not wholly occasion the Effect.



If the latter takes place, I presume it may in some measure be applied to account for the Effect, that the Damps, or Steams, which arise from Subterraneous Caverns, impregnated with Metalline *Effluvia*, have on the Lives of Animals : And yet at the same time, the same Air may suffer no Change in respect to its other Properties, I mean its Elasticity and specifick Gravity, in Comparison with other Air in the same Region.

2. I contriv'd a brass Box, about four Inches long, and an Inch and a half over : At one end, which I solder'd up, I fix'd two small brass Tubes ; one of which went through, and reach'd the remoter end nearly ; the other Tube was but just inserted in it, but each of them long enough to reach sufficiently above the Surface of the Water in which they were to be put. These Tubes were to convey the Air into a Receiver exhausted of its Air : It pass'd first into that Tube which nearly reach'd its opposite end, and so into the other which led to the exhausted Receiver. But the Box, with that part of the Tube that was within it, was first pressed full of brass Dust ; which I had the conveniency to do by means of a brass Cap, which screw'd on to the end, not before mention'd. This brass Dust I moistned with a little Water, thinking thereby to exert a more than ordinary Steam, or *Effluvia*, from the Metal, which the Air might take along with it, as it pass'd through such strait and narrow Avenues, as it must do between the brass Dust. In this manner it was put into the Water when Cold, and continued in it till it had boil'd a considerable time ; by which means it must, in all its Parts, be of the same Degree of Heat (at least) as the boiling Water. Thus it was taken out, and applied to the exhausted Receiver ; where, upon turning a Cock, I gave liberty for that Air only to pass into it, which must succeed through the brass Box and Dust, under the Circumstances before mentioned. When the Receiver was full of this Air, the Cover was taken off, and a lighted Candle plung'd into it, where it continued burning, even at the bottom, as if it had pass'd through no such *Medium*, but had been full of common Air. I took that Method to try it, believing the flame of a Candle to be the most tender way of discovering a Change in Air. Afterwards I repeated the same Experiment over again, with dry brass Dust instead of the former ; but the Success was the same. Therefore it seems to me, that such a Degree of Heat, as that of boiling Water, is not sufficient to cause any considerable Change (if any at all) in the Air ; nor such a Degree of Heat, able to strike any injurious, or suffocating *Effluvia*, out of the Metalline Particles.

The passing of Air through a red hot Glass Tube into an exhausted Receiver, had no manner of influence on a Sparrow put into the same : But upon passing of Air through red hot Charcoal, before it enter'd the Tube that convey'd it into the exhausted Receiver, the fore-mention'd Animal, in that *Medium* in about a quarter of a Minute, gave Signs of presently



presently expiring; but being taken out at the same time did recover, and continued living and well for some Days after. Yet it was concluded, had the Birds Continuance in the Receiver been but double that time, her recovery would have been very doubtful. I have likewise try'd Air pass'd through the Flames of Spirit of Wine, and Oil of Turpentine: The Effect was much the same as to the Spirit of Wine, the Flame of a Candle being immediately extinguish'd upon its being plung'd into it: But the Air which pass'd through the Flame of the Oil of Turpentine took some unctuous Fumes along with it into the exhausted Receiver; which Fumes, upon the near approach of a lighted Candle, suddenly took fire, and continued to burn on the upper Surface, till they were stified by covering close the Receiver: And upon several Repetitions it answer'd much the same, till the whole quantity of Fume was consum'd.

XLVI. The whole *Apparatus* is fix'd on a Table, parallel to its Surface. On one and the same *Axis* is fix'd a Sextant, of a *Radius* of 4 Feet, and a moving Limb to bear the Object. The Sextant is divided into Degrees and Minutes by a Diagonal, and remains always fixt. The Object, which is plac'd on the moving Limb, is seen parallel with the Table when observ'd through the Prism, and at no Degrees on the Sextant; but when any transparent Liquid is put into the same, the Object must be elevated till it appears to the Eye: Then observing how many degrees and Minutes the *Index* on the Limb cuts on the Sextant, we note it, and call it the Angle of Observation. Thus for different Liquids you have different Elevations of the Object, as you will find by the following Table. The Sight-Slit (if I may call it so) is compos'd of two pieces of box Wood, plan'd parallel to one another: These Pieces are separated only by 3 slender Slips of common Cards; and with that Intervention are screw'd down one upon the other, exactly parallel with the *Axis* of the moving Leg and Sextant. The Prism, through which it directs the Sight, is plac'd pretty near it, and consists of an Angle of  $44^{\circ} 54'$ , which Angle is fix'd Perpendicular to the Plane of the Table, its upper side being parallel with the same. The Object is a piece of white Paper, in form of a Cross, pasted on a black Board, and is fix'd, at the end of the moving Limb, which is in length about 7 Feet from the Sight; its Diameter is about  $2\frac{1}{2}$  Inches, which just comprehends the Sight through the Slit; so that when the Object is wholly within view, we conclude the Observation to be exact. With this *Apparatus* the Experiments are made as well by Candle-light as Day-light, (the Presence of the Sun Beams being no ways necessary) and I think they may be depended on as pretty accurate. I have taken the Specifick Gravity of the several Liquids, where I could obtain a sufficient quantity, as appears by the Table: So that if any Person should have the Curiosity to repeat these Experiments, he must expect

*A Description  
of the Appa-  
ratus for  
making Ex-  
periments on  
the Refractions  
of Fluids, ib.  
p. 204.*



a different Angle of Observation, if the Specifick Gravity agree not with the Table; for sometimes it happens, that Liquids of the same Denomination are not always of an equal Goodness, and consequently will have a different Specifick Gravity and Refraction.

The Christalline Humour of the Ox Eye I prest into the Angle of the Prism, whereby it received the form of it, and gave the Angle of Observation, as specify'd in the Table. I could not see the common Object through it, but was forc'd to make use of a Candle for that purpose; the Flame whereof appeared very broad, at least 5 or 6 Inches, nearly in the form of a Half-Moon: But what should occasion such a Change of figure, I cannot at present determine. Of all the Fluids I have try'd, I find nothing to refract a Ray of Light less than Water; yet there are several other Liquids which make the same Angle. I observe Oil of Bees-Wax to be the lightest Fluid, and Butter of Antimony *per Deliquium* to be much the heaviest: The difference of Specifick Gravity between these two Bodies, is as 662 is to 1976, that is, nearly as one to three: And the Ratio of their Refractions but as 10000 is to 6885 Bees-Wax, so is 5941 Antimony to the same *Radius*; that is, as one to 1.16, or thereabouts. Likewise Oil of Vitriol is in Specifick Gravity to Oil of Sassafras, as 1510 is to 898; yet the *Ratio* of Refraction of the lightest is most considerable, being in proportion as 10000 is to 6475 Sassafras; so is the same *Radius* to 7011 Vitriol. Thus I find, that a Body doth not Refract in proportion to its Specifick Gravity, but from some quality peculiar to its self.

The Specifick  
Gravities, &c.  
of several  
Fluids.

Specifick Gravities in Comparison with a bulk of Water equal to 820 Grains.		Angle of Observation. d. l.	Ratio of Re- fraction, as 10000 is to
		16.50	7485.3
Oil of Sassafras	898	29.20	6475.8
Turpentine	713.5	25.25	6741.8
Bees-Wax	662	23.30	6885.4
Carawayes	752	26.13	6696.5
Oranges	711	25.20	6741.2
Hyssop	769.5	25.10	6757.6
Rosemary	747	24.40	6794.7
Savin	789	25.30	6730.9
Origanum	752	25.00	6770.2
Pennyroyal	783	25.30	6730.9
Mint	780.5	26.00	6706.4
Spike	749	24.30	6807.3
Fennel	798	27.10	6616.5
Juniper	729	25.10	6757.6
Cummin	766.5	27.00	6627.7
Tansey	757	23.46	6865.1
Dill	795.5	27.40	6582.7



Oil of <i>Amber</i>	783	26.30		6662.3
<i>Cinnamon</i>	828	28.40		6517.7
<i>Cloves</i>	827	27.20		6606.8
<i>Nutmegs</i>	759	25.40		6721.4
Spirit of <i>Wine</i>	703.5	18.50		7287.9
<i>Hartshorn</i>	786	17.00		7468.3
<i>Vinegar</i>	824.5	17.00	As <i>Hartshorn</i> .	
<i>Sal Armoniack</i>	794.5	16.56		7475.2
<i>Acids, Spirit of Amber</i>	825	16.56	As <i>Sal Armoniack</i> .	
Oil of <i>Vitriol</i>	1510	21.56		7011.5
Spirit of <i>Nitre</i>	1166	20.50		7104.
<i>Aqua Regis</i>	987	19.50		7195.
<i>Aqua Fortis</i>	1157	20.40		7120.5
<i>Aqua Regis</i> from <i>Aqua Fortis</i> and <i>Sal Armoniac</i> .	1034	20.10		7161.5
Butter of <i>Antimony</i>	1976	40.00		5941.3
Spirit of <i>Raw Silk</i>	916	20.30		7135.
Spirit of <i>Honey</i>	716	16.50	As <i>Water</i> .	
Tinct. of <i>Antimony</i>	693	18.46		7294.3
<i>Jesuits Bark</i>	720	18.46	As Tinct. of <i>Antimony</i>	
<i>Bals. Tolu</i>	717	19.34		7219.3
<i>Gum Amoniacum</i>	719	19.10		7257.3
<i>Mettals</i> .	713	18.54		7281.7
<i>Vitreous Humor</i> of an <i>Oxes Eye</i>		16.50	As <i>Water</i> .	
<i>Chrystalline Humor</i> of the <i>Ox Eye</i>		24.10		6832.7
<i>White</i> of an <i>Hens Egg</i> .		17.40		7401.3
<i>Jelly</i> of <i>Hartshorn</i>		17.50		7384.7
<i>Human Saliva</i>		16.50	As <i>Water</i> .	
<i>Human Urin</i>		17.05		7451.9
<i>French Brandy</i>		18.20		7338.6
Oil of <i>Turpentine</i> strongly ting'd <i>Green</i> , with filings of <i>Brass</i> , no ways alters its <i>Refraction</i> .				

XLVII. The Experiment related by the late *Dr. Hooke*, in one of his of two Li-  
 Papers (delivered to me by *Mr. Waller*) is concerning two Liquors, <sup>quors, which,</sup>  
 which, when mixt together, would possess less space than when sepa- <sup>mixt possess less</sup>  
 rate; which he calls a Penetration of Dimensions: And adds further, <sup>space, than</sup>  
 That this Penetration is the cause of Heat, of Fire, of Flame, of the <sup>separate, n. 3313</sup>  
 Power of Heat, Fire, and Gun-powder, and several other *Phænomena*,  
 which seem to be most prodigious and wonderful in Nature. And since  
 the Experiment seem'd so considerable, as to account for several sur-  
 prizing Operations in Nature, I thought it very worthy an Examina-  
 tion, by a Repetition of the same.



Accordingly I procured a Bolt-head (such as he there describes) with a long small Stem, which I fill'd nearly full of common Water. The Stem was mark'd into several Divisions, on a piece of Paper pasted along it; by which means, I diligently observ'd the height of the Surface of the Water. Then pouring as much of it out as fill'd a certain Measure, which being thrown away, I fill'd the same Measure, as nicely as possible, to the same height, with strong Oil of Vitriol; which I return'd into the Bolt-head, in the room of so much Water taken from thence: Upon the mixing of these Liquors ensued a pretty strong Ebullition; and abundance of airy Particles were visibly extricated, and the Surface was not so high in the Stem considerably, as when it was possess'd only by Water. But here I must take notice, that two or three drops of Oil of Vitriol were accidentally spilt, in putting it into the Bolt-head; but yet the Experiment was very manifest, in the gradual decrease of the Dimensions of the Liquors. And 'tis to be observ'd, that although they became very warm, yet contrary to the Nature of most Liquors in such a State, they continued to possess less and less space; which was visible by the sinking of the Surface in the Stem of the Bolt-head; and in about half an Hours time, it had descended above an Inch: And when I visited it on the *Monday* following (for the Experiment was made on the *Thursday*) I found it had subsided at least two Inches below the mark I had left it at. Now whether the Ebullition produced by the Heat, might not evaporate that quantity, which it seem'd to lose in space; or whether, in so many Hours time, as it had been since the Experiment was made, there might not be such an Evaporation of the parts of the Fluid, as to become equal in bulk to the quantity of the dispossest'd space; and whether it was so or not, I gave my self Satisfaction after the following manner. Into an upright Glass that would hold about 3 Ounces of Water, I put a quantity of the same Fluid equal to 885 Grains: Into another Glass of the same Form, but smaller, I put a quantity of Oil of Vitriol equal to 456 Grains, which, with their respective Glasses, I weigh'd all together in a nice Ballance: After which, I put the Oil of Vitriol, Glass and all, into that which held the Water; where immediately a very great Ebullition began, and the Glass that contained them became so hot, as to be but just endured in the Hand. I found in two Minutes time it had lost of its Weight about two Grains: And at the end of an Hour, or better, it had decreased in all but 6 Grains and a half; by that time the Conflict was wholly ceas'd, it being then nearly reduced to the Temperature of the outward Air. After that, I weigh'd them at several Times, but found them in the same State, as to their Weight, as last mentioned. I continued them in the Scale till the next Morning, when I likewise could distinguish no manner of Alteration in the fore-mentioned Weight. From whence it plainly appears, that the decrease of bulk upon the mixing of these Liquors, does not proceed wholly from an Evaporation of their Parts; since by the last Experiment,



ment, the Evaporation continued no longer than the Fermentation lasted, but the decrease of the bulk of the Bodies, seems not to be performed all at once, or in so short a time, as may be taken notice of in the first Experiment.

XLVIII. The Success I had in producing Light through Bodies, such as Sealing-Wax, Pitch, and common Sulphur; gave me some Probability, <sup>*An Endeavour to produce Light through a Metallick*</sup> that under the same Circumstances I might likewise make some such <sup>*Body, under the Circumstances of a Vacuum and Attrition.*</sup> Discovery through a Metallick Body. Accordingly I caused a Glass <sup>*ib. p. 328.*</sup> Hemisphere to be made very strong: To this Hemisphere I procured another, of Burnish Brass, exactly made, to fall with its Brim about an Inch within the Glass, that I might the better cement them together; which I did securely from any ingress of the Air in that part. Thus, when joined, it became nearly a Globe; only the Diameter through its *Axis*, was somewhat more than its transverse Diameter, which was a disadvantage to its Strength, as the Sequel of this Relation will discover. In this manner I exhausted all its Air, as least nearly so, and then put it on the Machine to give it a circular Motion, as usual in such Experiments. I applied my Hand to the brass Hemisphere in Motion, but no Light could be discover'd within: I then rubb'd it with a Deal Stick, but the Success was the same. Afterwards I applied a piece of Sealing Wax, which has in itself a very Electrical Quality: This Wax, rubbing roughly on the Brass, seem'd to shake the Parts of it; nevertheless there did not any the least glimpse of Light appear. I then held the Flame of a Candle to the Brass in Motion, which something more than warm'd a Circle on it; hoping by this means, to excite or obtain some Discovery from it. Yet, notwithstanding a smart Attrition was made on that part, it was altogether unsuccessful. Being tir'd, I let in the Air, and suspended my farther Tryals till the following Night. At which time, when I had exhausted the Air from within the Globe, I began the Attrition with a Coal Cinder; which being somewhat rough, I thought it might shake the Parts of the Mettal, and put them into such a State or Mode, as to exhibit an Appearance of Light: But this, and whatever else I then did try, was to no purpose. In this exhausted State I left the Globe on the Engine, to consider a little what farther Tryals to make; with what Bodies, and in what manner to proceed with them: But to my great Surprise, in about an Hour after (being in the next Room) I heard a Noise almost as loud as a Musket when fir'd; and I immediately coming into the Room, found the Globe broken all to pieces (I mean the Glass half of it) and the Hemisphere on the Ground; which I took up, and found several Bruises it had received from the violent strokes of the broken Glass, which had dispersed it self in pieces all over the Room. A large Looking-Glass, at least three Yards distant from it, was crack'd almost from top to bottom, and quite cross the middle, by a Blow it received from a Fragment of it; for where it struck the Glass, the Cracks proceeded from



from it every way, like so many *Radii* drawn from a Center. Thus were the Experiments ended; and as I hinted before, this Accident I believe proceeded from the Unconformableness that the Figure of the compounded Globe had to a perfect Sphere, although it did not differ so much to sight, as to make me suspect any such Consequence. From these Experiments I may safely conclude, that if there be any such Quality as Light to be excited from a brass Body, under the fore mentioned Circumstances, all the Attritions of the several Bodies used for that purpose, have been too weak to force it from it. And indeed, considering the closeness of the Parts of Metal, and with what Firmness they adhere, entangle, or attract one another, a small degree of Attrition is not sufficient to put their Parts into such a Motion, as to produce an Electrical Quality; which Quality, under the fore-mentioned Circumstances, I take to be the Appearance of Light in such a *Medium*.

XLIX. 1. This Experiment affords a signal Confirmation of another formerly made, and differs only in the Matter made use of. I before used Sealing-Wax, but now made choice of Pitch, which I serv'd as the Sealing-Wax; that is, I melted it in a Globe-glass, and kept it turning about 'till the larger half had got a pretty thick lining of it; it was even so thick that a Ray of Light could no way penetrate it. This Globe I exhausted of its contained Air; then (being Night) I put it on the Engine to give Motion to it; where, after it had been turned a little while with my Hand on that half lined with the Pitch, I could very easily discover through the transparent part, on the inward Surface of the Pitch, the very shape and lines of it, as likewise of my Fingers; for the most eminent Parts of the Hand and Fingers that toucht the Glass, appeared all luminous: The other Parts discovered themselves by the dark Intervals they made between the enlighten'd Parts: And when the Fingers were spread or clos'd, 'twas very obvious to the Sight. Now after a small quantity of Air was let in, the Light disappear'd on the inside of the lined part (but not on the other,) which began to discover it self more and more on the outside; tho' even in Vacuo there was always a Light attended on the touch of those Parts that were most contiguous to the Glass: But now a Circle of Light would discover it self just on the edge of the Pitch which separated it from the transparent Part, as likewise another ring of Light somewhat nearer to the Axis of the Glass, but both these when the Hand was apply'd to the under part; for when it was remov'd to the contrary, no such appearance ensued. The transparent half of the Glass was in all Circumstances as in former Experiments. When all the Air was let in, the Electricity of the Glass in all its parts, the lin'd as well as the Transparent, performed much alike. The Threads seem'd to be attracted every where with equal Vigour. To conclude, this and the foremention'd Experiment of the Sealing-wax plainly discover a transparent Quality in some Bodies (we call Opake) under such and such Circumstances:

Of Objects becoming visible through Pitch in the dark, n.

3<sup>22</sup>. p. 391.  
† See Phyl. Mech. Exp. p. 13.



stances: Bodies which are really Opake, have hitherto been thought to continue always so. It was never so much as suspected, that they could exchange that Quality for the contrary one, and then come back from that contrary one to their old State again: That they should pass from Opake to Pellucid, and from Pellucid to Opake; at one time admit, and at another time oppose the Passage of Light: And all this by a meer change of external Circumstances. This Property I say is as new as 'tis real and surprizing; and the bare Consideration of so very unlikely and unexpected a thing, may be a ground of Encouragement to hope, that some other odd Properties of Bodies, by some lucky Tryals, may hereafter (as this has done) surprize us with a discovery of themselves.

2. Notwithstanding Sealing-Wax and Pitch afford such surprizing Phenomena, rendring the Form of Bodies visible through their Opake Substances, under the Circumstances of a Vacuum and Attrition; yet there are other Bodies, by which very different Effects will be produc'd; of which I shall give you a very remarkable Example: And that is in Flowers of Sulphur, or Sulphur Sublim'd. About half a Pound of this Preparation I melted in a Ladle, and pour'd it into a Globe Glass, and used it in all respects as in the other Experiments. And when it was exhausted, and Motion and Attrition given, I expected as before to have seen a Light on its inside: But all that we could do had no manner of Effect on it, in relation to such an Appearance, neither when it was exhausted, nor when replete with Air: There was nothing to be observ'd but a very small weak Light, which after long rubbing, shew'd it self in that part where the Hand touch'd the Glass. But when I came to look upon it, I found the sulphurous Lining all in a body disengag'd from the Concave surface of the Glass. As to the Electricity of the Globe lin'd with this sort of Matter; after the Attrition of it had been continued for some time, and the Glass was become pretty warm (at the same time full of common Air) the Hoop of Threads was held over it; but the Attraction was very inconsiderable on the lin'd part, though on the transparent side the Threads were pretty vigorously directed; yet not with that force and strength, as when the Glass is perfectly clear within, as this was not; because the Fumes of the melted Sulphur adhering to it, made it appear somewhat Cloudy.

3. I took a quantity of common Sulphur, nearly equal to what I had used before of the Flowers; which having melted as before, I pour'd it into another Globe-Glass, which I us'd in all Respects as the former. But when I had exhausted it, and given the usual Motion and Attrition, the Effect was so surprizingly different, that one would scarce think it should proceed from the same sort of body. For the Figure of my Hand and Fingers appear'd not only on its inside, (though more faint and pale than in the Experiments of Sealing Wax and Pitch,) but on its outside there appear'd a brisk purple Light, so beautiful and agreeable to the Eye, that it was very pleasant to behold. The Strength of this Light may be judged from hence, That the Lines of the Palm of my Hand,

*The same in a Glass lin'd with melted Flowers of Sulphur. n. 323. p 419.*

*With Common Sulphur.*



Hand, which being near the touching Parts, were easily discoverable by it; and were a small Print plac'd at the distance, I question not but it would be legible without any great Difficulty. And as this common Sulphur differ'd vastly in that part of the Experiment already related, from the former, so likewise in the latter, for when the Hoop of Threads came to be held over it, (under the same Circumstances as in the other) they were directed toward it as vigorously as in any Experiment heretofore made. The parts lin'd and transparent perform'd much alike; if there was any Difference, it seem'd to incline to that part lin'd with the Sulphur. Likewise in this Experiment as in the last, the Sulphur was loosen'd and separated from the Glass that contain'd it: which therefore cannot be urg'd, as any ways conducive to the Unsuccessfulness of the former.

*With a larger  
quantity of  
Sulphur.*

4. Into a Globe Glass of the same size of the former, which was about five Inches Diameter, I pour'd about two Pound of melted Sulphur: This, when cold, contracted it self, and became loose from every part of the Glass, as in the former Experiments: The Sulphur cover'd more than half the inward surface of the Globe, and its thinnest part was about half an Inch in Thickness. Towards the Axis it appear'd to be more than a full Inch in Substance. This Glass, when exhausted of its Air, was used in every thing as the former. The Light produc'd was very considerable, I mean that on its outside, and attended with the same Colour and Vivacity as before; nor was that less vigorous on its inside. Comparing it with the former, notwithstanding the Thickness of the Lining, it was at least four times greater; but the Figure of the Fingers was now not so distinguishable as in the other. But on the part near the Axis (as I hinted before) where the substance of the Sulphur was much the greatest, no Light was produc'd; which may be attributed in a great measure to the Slowness of the Motion and the Weakness of it there, in Comparison with that which is made more remote from it, where it was that the Light was seen within. What farther is observable, was that the Light which was visible on its outside only, appear'd to be produc'd between the inward Surface of the Glass and the Convex Surface of the Sulphur; the Sulphur being loose from it gave liberty for the Air to be taken from thence as well as from the other Parts: The Light which was there produc'd, being reflected by the hard, polish'd, and nearly contiguous Body of Sulphur, seems to me to be the Reason why it appear'd with so much Vigour. This outward Light would sometimes break into Branches all over the lin'd part of the Globe, in as odd, and as pleasant a manner, as what has been taken notice of in former Experiments, with the large Globe Glass, upon letting in a little Air. And what farther occur'd in this Experiment was, that when the Attrition was ceas'd, but the Globe continuing its Motion, abundance of Sparks of Light would appear all round it, and continue so to do for some time, without any fresh Attrition. I cannot conclude without taking some notice, that in the Experiments formerly made on Sulphur, mention'd in my Book of *Physico-Mechanical Experiments*, I us'd the same  
sort



fort as in the first of these; and had it been my Chance to have happen'd on the common fort, I doubt not but the Success of it would have been different from what is there related, which I hope to try at one time or other.

Hence we may see what remarkable Changes may be produc'd in Bodies, with respect to their electrical and luminous Qualities, by their different Management and Preparation: As here 'tis plain that common Sulphur, which is plentifully endow'd with both these Qualities, by undergoing the Chymical Fire (which *sublimes* it into Flowers,) is almost totally depriv'd of them both.

L. The Fishes made use of in the following Experiments were Gudgeons; which are a sort of Fish very brisk and lively in the Water, and will live a pretty considerable time out of it. Three of them I put into a Glass Vessel, to about three Pints of common Water (which were to be a Standard to compare the others by.) Into another Glass to a like quantity of Water, I put three more of them, which quantity of Water just fill'd this Glass to the very Brim; upon which I screw'd down a Brass Plate with a Leather between, to prevent a Communication with the Water in the Glass and the external Air: And that it might the better resemble a Pond of Water frozen over (on which account this Experiment was made) I suffer'd as little Air as possible to remain on the Surface of the included Water. The third Glass had a like quantity of Water put into it as the former; which Water, first by boiling, then by continuing it a whole Night in *Vacuo* on the Air Pump, was purg'd of its Air to the greatest nicety: Into this Water also, I put a like number of Gudgeons as into the other. Thus (the Fishes being all put into their respective Receivers) I apply'd my self to wait the Event; which was as follows. It was about half an Hour after ten in the Morning when I began the Experiments; and in about half an Hour from that time, I observ'd the Fishes in the exhausted Water, or Water purg'd of its Air, began to discover some Uneasiness, by a more than ordinary Motion in their Mouths and Gills, or Respiration, if I may call it so, differing from the Fishes in the other Glasses; the included Fishes at the same time discovering no Alteration; only I took notice that they would now and then ascend to the top of the Water, but suddenly swim down again: And in this State they continued for some considerable time, without any sensible Alteration. About 5 Hours after the last Observation, the Fishes in the exhausted Water became not so active (upon a Motion given the Glass that contain'd them) as before; And those Gudgeons included without any Communication with the outward Air, now began considerably to abate of their Vivacity; yet still continued at times their Motions upward and down again. At Seven in the Evening, the included Fishes lay all at the bottom of the Glass, with their Bellies upwards; nor upon shaking the Glass, could I put them in Motion, or cause them to stir their Fins or Tail; only I could observe a Motion in their Mouths, which shew'd me they were not perfectly dead.

*Of keeping Fishes in Water under different Circumstances, by Mr. Hawksbee, n. 333. p. 431.*



In this State they lay for some time : But considering the Experiment would not be compleat, if I did not attempt their Recovery by taking off the brass Cover, being very sure they must have dy'd in some small time under the Circumstances they were then in, accordingly I took off the Cover, and gave the Surface of the Water a free and open Communication with the external Air. At about ten at Night, I observ'd them again ; at which time their Recovery was so evident, that upon a little disturbing the Glafs that contain'd them, they were actually in Motion again : And at this time also, the Fishes in the Water purg'd of Air, began to appear more brisk and lively than at the last Observation. Here I cannot but take notice, that notwithstanding the Water was purg'd of its Air to a very great degree, yet the Fishes put into it did not so much as once ascend in it ; but continued always at the bottom, as the Fishes did in the common Water. At this time I left them till the next Morning ; when about Eight a Clock I found them as perfectly well and lively in all the Glasses, as when they were first put in. Those in the common Water expos'd to the open Air, suffer'd no manner of Change during the whole time. After this I was willing to try whether the Air had again insinuated itself into the purg'd Water, and whether that might not be the occasion of the Fishes Recovery. Accordingly I put it on the Plate of my Pump, in the same Glafs with the Fishes in it ; and being cover'd with another Receiver, the Air was taken from it ; yet I could perceive very little Air ascend in it, and to me it seem'd to be much in the same State as when the Fishes were first put in. I continu'd it in *Vacuo* about an Hour and half ; the Fishes almost all the time continued at the top of the Water, and at that time appeared as dead ; for upon letting in the air, they sunk hastily to the bottom, without any Motion of their Fins or Tails.

From the whole account I observe,

*First*, That Water purg'd of air, so far as the Method here made use of is capable to do it, renders it not altogether unfit to support the Lives of Water Animals. For although when the Fishes were first put in, and for some Hours after, they seem'd to suffer some Uneasiness ; yet at length the Water became more familiar to them, or their Constitutions in some measure did so conform, as to render the Water to them, and them to the Water more agreeable : Otherwise I do not see how their Recovery should follow, since upon examining, little or no alteration could be found in the Circumstances of the Water, from the time the Fishes were first put in.

*Secondly*, The Fishes included with the Water from any Communication with the external Air, plainly demonstrate, that common Water in its natural State is not alone sufficient to preserve the Lives of its natural Animals. Hence it follows, That in Ponds, when the Water comes to be frozen over with a pretty thick Ice, the Fishes in the said Ponds are very likely, if not certain to perish, upon the Continuance of such a Congelation for some time on their Surfaces ; unless (as in the latter



part of the Experiments) the Impediment, which hinder'd the immediate Contact of the Air to the Surface of the Water be remov'd; that is, by breaking Holes in the Ice, whereby it is restored, and undoubtedly will perform the same thing as my Removal of the brass Plate. This is to be understood only in Ponds, where the Water is stagnant; for where there are Springs, or a current of Water constantly succeeding under the Ice, the Effect most likely will not be the same.

LI. The glass Planes which I used were about 6 Inches square; and being very clean, a drop or two of Oil of Oranges was let fall on the lower Plane, suppose at *B*; then the upper Plane was laid on it, so near as to touch the Liquid, that it might become contiguous to both their Surfaces. Thus the Planes being made to touch one another at the side *A*, and open'd at the side *C*, as in the Scheme above, the lower Plane lying parallel with the Horizon, the drop of Oil would immediately move towards the touching side of the Planes; and when it was arrived there, it was but reversing the Angle, and the drop would return from *A* to *C*; and after the same manner it might be directed to any side or part of the same. Moreover, if the Planes were elevated 8 or 10 degrees at *A*, yet would the drop ascend towards the side *A*, tho' not so swift as when the Planes were in the fore-mention'd Position. It was farther to be observed, that the nearer the drop approach'd the touching side, so would the Velocity of its Motion be encreased: The reason of which seems very plain, allowing the ascent of Water in small Tubes, and between the Surfaces of nearly contiguous Planes, to be explain'd from the Power of Attraction that one Surface has to another at such a Nearness (as I see no reason to doubt of it:) For the drop of Oil moving on towards the contiguous Surfaces, comes to enlarge its space, and touches the Planes in more and more Parts, as it approaches nearer and nearer the touching side. Thus in the whole Progress of its Motion, it is continually encreasing in its Surface, and consequently the Power of Attraction must encrease in proportion to that Surface; so that the Celerity of its Motion must necessarily be augmented. This Experiment seems very powerfully to confirm the Experiments made before on the same Subject, from the gradual increase of the Motion of the Drop; representing thereby the several Appearances of the ascent of Water in different siz'd Tubes, or between Planes whose Surfaces are placed at different Distances, the slower Motion representing those Experiments made in larger, and the swifter in smaller Tubes; the same to be observed in different distanc'd Planes.

I have since repeated the same Experiment in *vacuo*, where in all Respects, it answered as in the open Air; which is a plain Indication, that the Presence of the Air has nothing at all to do in producing this Phenomenon.

*of the Attraction of Oil between two Glass Planes, n. 332. p. 395. Plate 4. Fig. 4.*



Of the Angle  
requir'd to  
suspend a drop  
of Oil of  
Oranges, at  
certain Stations  
between two  
Glass Planes,  
n. 334. p. 473.

LII. I procured two glass Planes that measured a *Radius* of twenty Inches each; their breadth was about 3 Inches: That which I used for the lower Plane, was plac'd with its Surface parallel with the Center of its *Axis*, and parallel with the Horizon. Thus (the Planes being very clean) they were rubb'd with a clean Linnen Cloth dipt in Oil of Oranges: Then a drop or two of the same Oil being let fall on the lower Plane near the *Axis*, the other Plane was laid on it; which so soon as it touch'd the Oil, the Oil spread itself considerably between both their Surfaces. Then the upper Plane being rais'd a little at the same end by a Screw, the Oil immediately attracted it self into a Body, forming a Globule contiguous to both Surfaces, and began to move forwards toward the touching ends. When it had arriv'd two Inches from the *Axis*, an Elevation of 15 Minutes at the touching ends stopt its Progreß, and it remain'd there without Motion any way. The Planes being let fall again, the drop mov'd forward till it came to four Inches from the Center; then an Elevation of 25 Minutes was requir'd to give it a fixt Station. At 6 Inches it requir'd an Angle of 35 Minutes; at 8, of 45 Minutes; at 10, a Degree. At 12 Inches from the *Axis*, the Elevation was 1 Degree 45 Minutes; and so on, at the several Stations, as they stand in the following Table. This, after abundance of Tryals, I take to be the most correct, tho' the others succeeded very little different from the same. It is to be observed, That when the Globule or Drop, had arriv'd to near 17 Inches on the Planes from their *Axis*, it would become of an Oval form; and as it ascended higher, so would its Figure become more and more oblong; and unless the Drop was small, upon such an Elevation of the Planes as was requir'd at such a Progreß of the Drop, it would be parted, some of it descending, and the rest of it running up to the top at once: But upon a Drop that separated thereabouts, I found the remaining part of it at 18 Inches, would bear an Angle of Elevation equal to 22 Degrees to ballance the weight of it. Higher than that I could not observe. The Planes were separated at their *Axis* about  $\frac{1}{16}$  of an Inch. I found but little difference between small and larger Drops of the Oil, in relation to the Experiment. The Angles were measured by a Quadrant mark'd on Paper of near 20 Inches *Radius*, divided into Degrees and Quarters.

Distance in Inches  
from the *Axis*.

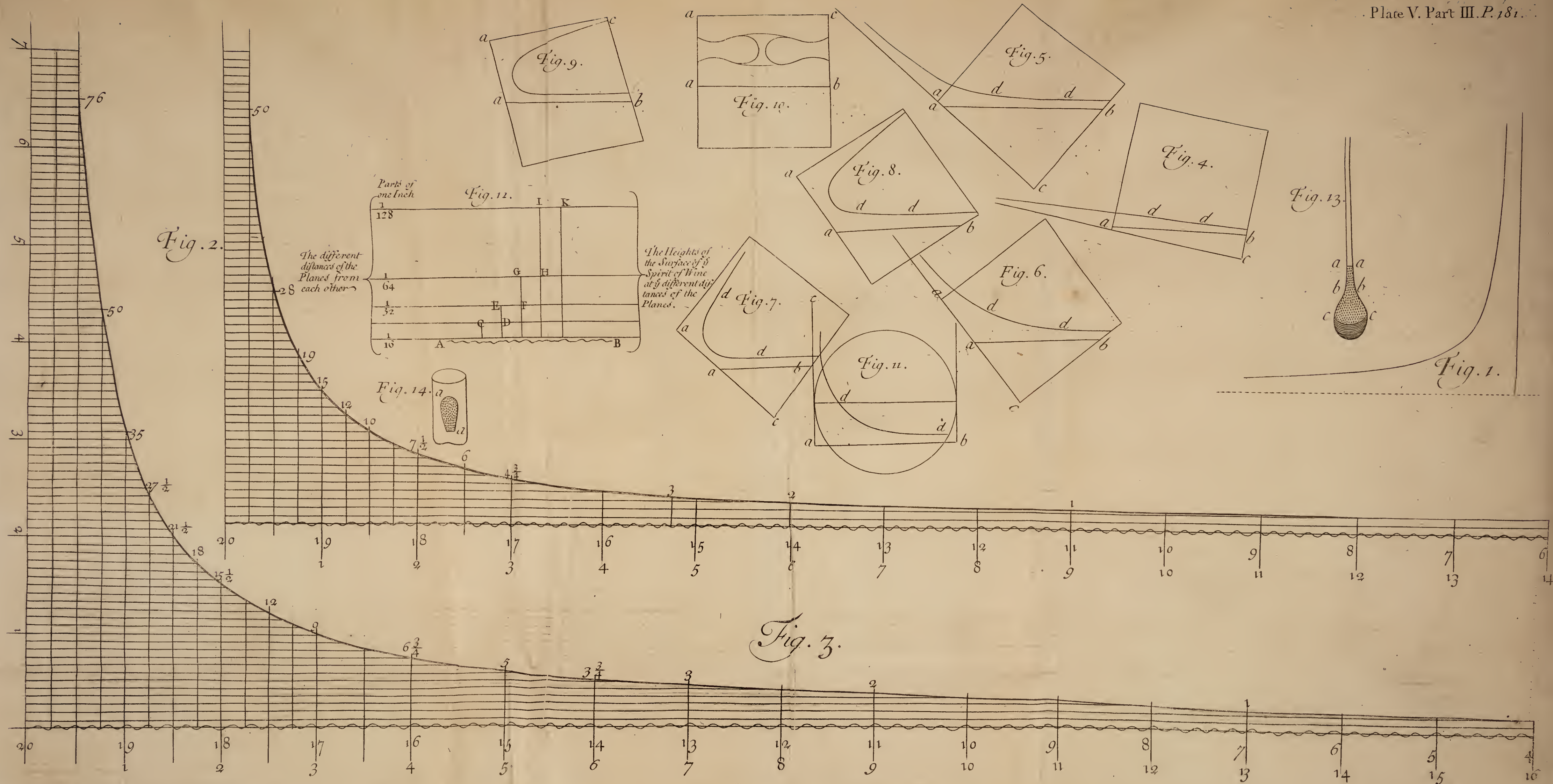
Angle of Elevation.  
D. M.

2	—————	0—15
4	—————	0—25
6	—————	0—35
8	—————	0—45
10	—————	1—00
12	—————	1—45
14	—————	2—45
15	—————	4—00
16	—————	6—00
17	—————	10—00
18	—————	22—00











LIII. 1. I fasten'd two pieces of Glass together, as flat as I could get; so that they were inclin'd in an Angle of about  $2^\circ$  and  $\frac{1}{4}$ . Then I set them in the Water with the contiguous edges perpendicular. The upper part of the Water by rising between them, made this Hyperbola, which I copied from the Glass. I have examined it as well as I can, and it seems to approach very near to the common Hyperbola; but my Apparatus was not nice enough to discover this exactly. The perpendicular Asymptote was exactly determin'd by the edge of the Glass, but the horizontal one I could not so well discover: not having Conveniences to make it in so successful a manner as I could wish.

*Of the ascent of Water between two Glass Planes, by Dr. Taylor, n. 336. p. 538. Plate 5. Fig. 1.*

2. I took two glass Planes, each somewhat more than 20 Inches long, of the truest Surfaces I could procure. These being held close together at one of their Ends, the other Ends were opened exactly to an Angle of 20 Minutes. In this Form they were edgeways put into a Trough of ting'd Water, which immediately arose between them in the Figure of the annex Scheme. At another time the Planes were opened to an Angle of 40 Minutes; then the Water appear'd between them, as in the Scheme with that Title. By these Schemes the Proportions of the Power of Attraction are in some measure evident to the Eye; for there may be seen at the several Distances, how many Lines (which are 12ths of Inches.) the Water is elevated, and the prodigious increase of them near the touching Ends. I hope the Tables are pretty accurate; for after many Tryals, I find the Successes to be much the same, according to the different Angles.

*by Mr. Hauksbee, ib. p. 539.*

*Plate 5. Fig. 2. & 3.*

*A Table according to the Scheme of the Planes opened to an Angle of 40 Minutes, in Fig. 2.*

Distances in Inches and Parts of Inches from the touching Ends.	Number of Lines elevated at the several Distans.
9. —————	1.
6. —————	2.
$4\frac{3}{4}$ . —————	3.
3. —————	$4\frac{3}{4}$
$2\frac{1}{2}$ . —————	6.
2. —————	$7\frac{1}{2}$
$1\frac{1}{2}$ . —————	10.
$1\frac{1}{4}$ . —————	12.
1. —————	15.
$0\frac{3}{4}$ . —————	19.
$0\frac{1}{2}$ . —————	28.
$0\frac{1}{4}$ . —————	50.

*A Table according to the Scheme of the Planes opened to an Angle of 20 Minutes, in Fig. 3.*

Distances in Inches and Parts of Inches from the touching ends.	Number of Lines elevated at the several Distances.
13. —————	1.
9. —————	2.
7. —————	3.
6. —————	$3\frac{3}{4}$
5. —————	5.
4. —————	$6\frac{3}{4}$
3. —————	9.
$2\frac{1}{2}$ . —————	12.
2. —————	$15\frac{1}{2}$
$1\frac{3}{4}$ . —————	18.
$1\frac{1}{2}$ . —————	$21\frac{1}{2}$
$1\frac{1}{4}$ . —————	$27\frac{1}{2}$
1. —————	35.
$0\frac{3}{4}$ . —————	50.
$0\frac{1}{2}$ . —————	76.

The



no. 337.p.153.

Plate 5.

The Figure of the Hyberbolick Curve above-mention'd gave me occasion to make further Enquiries; and by many Experiments I find, that the same Curve holds in all Directions of the Planes, the Asymptotes being always, one the Surface of the Water, the other a Line drawn along the touching Sides. Thus, when the touching Sides were plung'd under the Surface of the Water, and the Angle  $c$  was depress'd and made to remain lower than the Angle  $a$ . as in *Fig. 4.* then would be produc'd such an oblique Curve, as may be observ'd in that Figure. In all the several Schemes,  $ab$  represents the Surface of the Water on the outside of the Planes, and  $ac$  the touching Sides of the same. Now, though the Curve  $dd$  rises between the Planes in such an obliquity, yet does it conform it self in its Figure to the Asymptotes, viz.  $ab$  the Surface of the Water, and  $ac$  the touching Sides of the Planes; for supposing the Asymptote  $ac$  to be continued, as in the prick'd Line, till it surmounts the Surface of the Water to such a height; or suppose the Planes extended in the same manner; then would the Water remain between them in the appearance of the prick'd Lines, being at all distances from the Axis of the Curve, equal in respect to the Asymptotes; and so of all the rest of the Curves, as in the Figures 5, 6, 7, 8, 9. which are the result of the several Angles, made by the touching Sides of the Planes. Now when the touching Sides were plac'd upwards, parallel to the Surface of the Water (as in *Figure 10.*) and plung'd wholly under the same, then upon lifting them up, in the same Position, till the weight of the Water between the Planes over-ballanc'd the Power of their Attraction; two Curves, one from each side of the Planes, would open themselves, and meet each other in the middle, as represented in the aforesaid Figure; where they would unite, and make a Figure as joined by the prick'd Lines, being wider in the middle than towards the sides of the Planes. And it is highly remarkable, that this Curve would always break out between the Planes, at an equal distance between the touching sides and the Surface of the Water.

The same Figure is likewise produc'd between two round gla's Planes, (see *Fig. 11.*) the Asymptotes being the same as the former; that is to say, one the Surface of the Water, the other a Tangent drawn from the touching Point, parallel to a Tangent drawn from the open or opposite part of the Planes, being at right Angles with a Line drawn through the Axis of the same. These Experiments I find to answer the same in *Vacuo*, as in the open Air; so that that Element has nothing to do in this extraordinary appearance.

The Planes made use of in the foregoing Experiments were about 7 Inches square, open'd on one side to an Angle of 20 Minutes or thereabouts; the round Planes were in Diameter near 3 Inches.

Of the ascent  
of Spirit of  
Wine between  
two Glass  
Planes, by  
Mr. Hauks-  
bee, *ib.* p. 151

LIV. I took two glass Planes, about 6 Inches long, and two broad: These (being made clean) I separated at each end by the number of 32 pieces of brass *Lamina*, whose Thickness, when laid one upon another, and



and press'd together by Screws, made a distance between the Planes equal to (as near as I could measure)  $\frac{7}{8}$  of an Inch. Being thus prepar'd, I plung'd one end of them into some ting'd Spirit of Wine; and after I had wetted the inward Surfaces of the Planes with it, by declining the upper end, I set them upright; and found that the Surface of the Wine between them remain'd higher than the Surface of the Wine on their outsides, by a distance equal to the first Line *CD* above the Line *AB*, the Line *AB* being the common Surface, in all the Tryals, on the outside of the Planes. After this, I reduc'd the distances of the Planes to half the former, by taking away 16 of the brass *Laminae* from each end of them; then being plung'd into the Liquid, and used in all respects as before, I found the Wine to stand between the Planes just double the height it stood at in the former Tryal; as may be observ'd by the Line *EF* in the Scheme. Again removing half the number of brass pieces, whereby but 8 of them were left at each end, and using them as in the preceeding manner, the Wine rose between them to a height just double to that in the foregoing Tryal, mark'd in the Scheme by the Line *GH*. Thus from 8 I reduc'd them to 4 pieces at each end of the Planes; then again the Wine was seen to remain suspended to twice the last observ'd height, represented by the Line *IK*. In this last tryal the Planes were distant one from the other but  $\frac{1}{8}$  of an Inch; nearer than that I could make no certain Measure; but I suppose the forecited Experiments are sufficient to ground a Calculation upon, even of the most near Approximations.

The Spirit of Wine did not move between the Planes with that nimbleness as Oil of Oranges, which gave me the Liberty to observe the Angles with more Deliberation. The Limb on which the Planes were laid, mov'd in the Center of a Quadrant of a four Foot Radius; the Largeness of which gave me conveniency of measuring the Angles with greater accuracy: But the distance between the Drop on the Planes and the Graduations on the Quadrant, made it a little difficult to observe them both at once. Yet I believe the following Tables may be depended on to be as true as the nature of such an Experiment (for *supra* p. 180. any thing that I see at present) is capable of. I have formerly given a particular account of the manner of making this Experiment. These Tables are calculated from the touching Ends of the Planes; and it is to be observ'd, That in the Table where the Planes were open'd but to an Angle of 10' that I could not come nearer than 4 Inches of the touching Ends in my Observations: But so far as I could go, seems to be much in the same Proportion (as I have oftentimes observed in the course of these Experiments) with the Table where the Planes were opened to an Angle of 18'.



Distances in Inches  
from the touching  
Ends.

Angle of  
Elevation.  
D. M.

Distances in Inches  
from the touching  
Ends.

Angle of Ele-  
vation.  
D. M.

18 $\frac{1}{2}$	————	0—45	18 $\frac{1}{2}$	————	1—30
16 $\frac{1}{2}$	————	0—55	16 $\frac{1}{2}$	————	1—50
14 $\frac{1}{2}$	————	1—05	14 $\frac{1}{2}$	————	2—10
12 $\frac{1}{2}$	————	1—20	12 $\frac{1}{2}$	————	2—40
10 $\frac{1}{2}$	————	1—30	10 $\frac{1}{2}$	————	3—10
9 $\frac{1}{2}$	————	1—40	9 $\frac{1}{2}$	————	3—30
8 $\frac{1}{2}$	————	2—00	8 $\frac{1}{2}$	————	4—00
7 $\frac{1}{2}$	————	2—30	7 $\frac{1}{2}$	————	5—05
6 $\frac{1}{2}$	————	3—20	6 $\frac{1}{2}$	————	7—40
5 $\frac{1}{2}$	————	4—25	5 $\frac{1}{2}$	————	10—50
4 $\frac{1}{2}$	————	6—00	4 $\frac{1}{2}$	————	14—00
4	————	7—23	4	————	18—00
3 $\frac{3}{4}$	————	8—40	The Planes opened to an Angle of 10'		
3 $\frac{1}{2}$	————	9—25			
3 $\frac{1}{4}$	————	10—30			
3	————	12—40			
2 $\frac{3}{4}$	————	15—00			
2 $\frac{1}{2}$	————	18—50			
2 $\frac{1}{4}$	————	23—25			
2	————	30—00			

The Planes open'd to an Angle  
of 18'.

Of the Ascent  
and Suspension  
of Water in  
Capillary Tubes  
by Dr. Jurin,  
n. 355. p. 739.

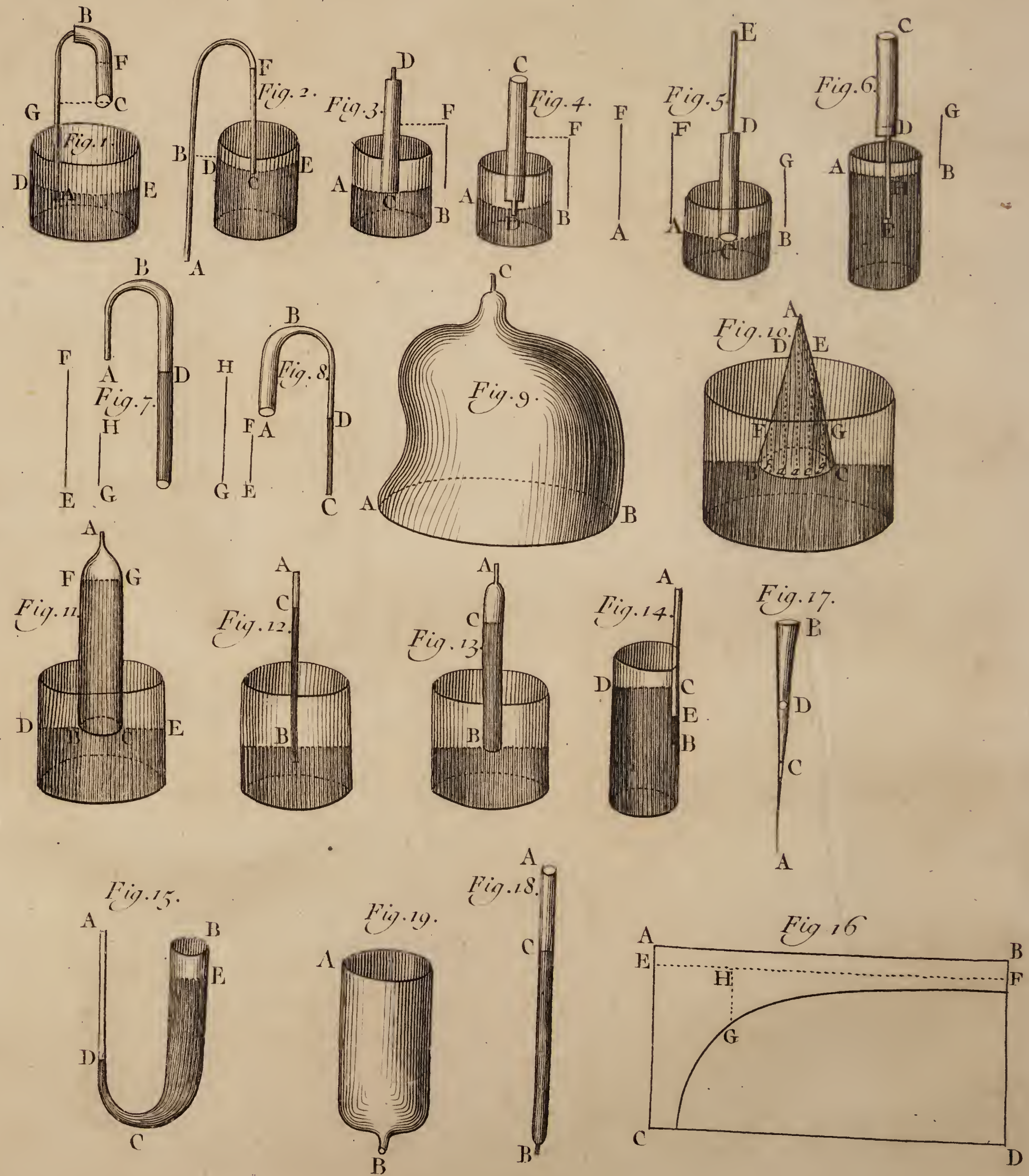
LV. Some Days ago the following Method was proposed to me by an ingenious Friend, for making a perpetual Motion, which seem'd so plausible, and indeed so easily demonstrable from an Observation of the late Mr. Hawksbee, said to be grounded upon Experiment, that though I am far from having any Opinion of attempts of this Nature, yet I confess, I could not see why it should not succeed. Upon tryal indeed I found myself disappointed. But this Proposal has given occasion not only to rectify some Mistakes into which we had been led, by the Gentleman above named, but likewise to detect the real Principle, by which Water is rais'd and suspended in capillary Tubes above the Level.

Fig. 1. Let  $ABC$  be a capillary Siphon, compos'd of two Legs  $AB$ ,  $BC$ , unequal both in length and Diameter; whose longer and narrower Leg  $AB$  having its Orifice  $A$  immerst in Water, the Water will rise above the Level, till it fills the whole Tube  $AB$ , and will then continue suspended. If the wider and shorter Leg  $BC$ , be in like manner immerst, the Water will only rise to some height as  $FC$ , less than the entire height of the Tube  $BC$ .

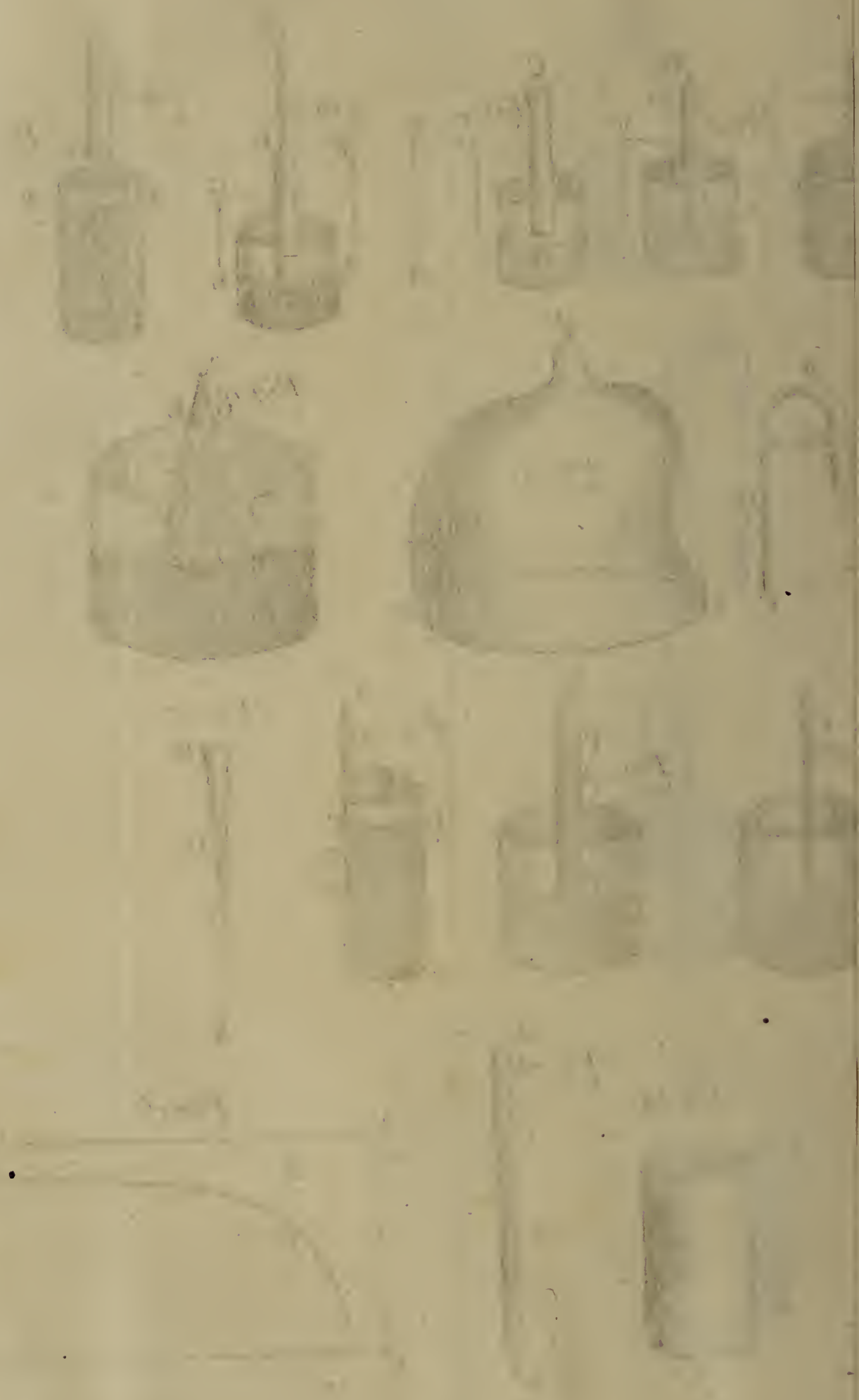
This Siphon being fill'd with Water, and the Orifice  $A$  sunk below the Surface of the Water  $DE$ , my Friend reasons thus.

Since











Since the two Columns of Water  $AB$  and  $FC$ , by the Supposition, will be suspended by some Power acting within the Tubes they are contain'd in, they cannot determine the Water to move one way, or the other. But the Column  $BF$ , having nothing to support it, must descend, and cause the Water to run out at  $C$ . Then the pressure of the Atmosphere driving the Water upward through the Orifice  $A$ , to supply the Vacuity, which would otherwise be left in the upper part of the Tube  $BC$ , this must necessarily produce a perpetual Motion, since the Water runs into the same Vessel, out of which it rises. But the Fallacy of this reasoning appears upon making the Experiment.

*Exp. 1.* For the Water, instead of running out at the Orifice  $C$ , rises upward towards  $F$ , and running all out of the Leg  $BC$ , remains suspended in the other Leg to the height  $AB$ .

*Exp. 2.* The same thing succeeds upon taking the Siphon out of the Water, into which its lower Orifice  $A$  had been immerst, the Water then falling in drops out of the Orifice  $A$ , and standing at last at the height  $AB$ . But in making these two Experiments, it is necessary that  $AG$  the difference of the Legs exceed  $FC$ , otherwise the Water will not run either way.

*Exp. 3.* Upon inverting the Siphon full of Water, it continues without Motion either way.

The reason of all which will plainly appear, when we come to discover the Principle, by which the Water is suspended in Capillary Tubes.

Mr. *Hawksbee's* Observation is as follows.

*Fig. 2.* Let  $ABFC$  be a capillary Siphon, into the which the Water will rise above the Level to the height  $CF$ , and let  $BA$  be the depth of the Orifice of its longer Leg below the Surface of the Water  $DE$ . Then the Siphon being fill'd with Water, if  $BA$  be not greater than  $CF$ , the Water will not run out at  $A$ , but will remain suspended.

This seems indeed very plausible at first sight. For since the Column of Water  $FC$  will be suspended by some power within the Tube, why should not the Column  $BA$ , being equal to, or less than the former, continue suspended by the same Power?

*Exp. 4.* In fact, if the Orifice  $C$  be lifted up out of the Water  $DE$ , the Water in the Tube will continue suspended, unless  $BA$  exceed  $FC$ .

*Exp. 5.* But when  $C$  is never so little immerst in the Water, immediately the Water in the Tube runs out in drops at the Orifice  $A$ , though the length  $AB$  be considerably less than the height  $CF$ .

Mr. *Hawksbee* in his Book of Experiments has advanced another Observation, namely, that the shorter Leg of a Capillary Siphon, as  $ABFC$ , must be immerst in the Water to the depth  $FC$ , which is equal to the height of the Column, that would be suspended in it, before the Water will run out at the longer Leg.

*Exp. 6.* From what Mistake this has proceeded, I cannot imagine; for the Water runs out at the longer Leg, as soon as the Orifice of the shorter



ter leg comes to touch the Surface of the stagnant Water, without being at all immerst therein.

I go on to enquire into the Cause of the ascent and suspension of Water in Capillary Tubes.

That this Phenomenon is no way owing to the pressure of the Atmosphere, has been I think sufficiently prov'd by Mr. *Hawksbee's* Experiments.

And that the cause assign'd by the same, namely the attraction of the concave Surface, in which the suspended Liquor is contain'd, is likewise insufficient for producing this Effect, I thus demonstrate.

Since in every capillary Tube the height, to which the Water will spontaneously ascend, is reciprocally as the Diameter of the Tube, it follows, That the Surface containing the suspended Water in every Tube is always a given Quantity: but the Column of Water suspended is, as the Diameter of the Tube. Therefore, if the attraction of the containing Surface be the cause of the Waters suspension; it will follow, that equal Causes produce unequal Effects, which is absurd.

To this it may perhaps be objected, That in two Tubes of unequal Diameters, the Circumstances are different, and therefore the two Causes, though they be equal in themselves, may produce Effects that are unequal. For the lesser Tube has not only a greater Curvature, but those parts of the Water, which lie in the middle of the Tube, are nearer to the attracting Surface, than in the wider. But from this if any thing follows, it must be, that the narrower Tube will suspend the greater quantity of Water, which is contrary to Experiment. For the Columns suspended are as the Diameters of the Tubes.

But as Experiments are generally more satisfactory in things of this nature, than Mathematical reasonings, it may not be amiss to make use of the following, which appear to me to contain an *Experimentum Crucis*.

*Fig. 3.* The Tube *CD* is composed of two parts, in the wider of which the Water will rise spontaneously to the height *BF*, but the narrower part, if it were of a sufficient length, would raise the Water to a height equal to *CD*.

*Exp. 7.* This Tube being fill'd with Water, and the wider end *C* immerst in the stagnant Water *AB*, the whole continues suspended.

*Exp. 8. Fig. 4.* The narrower end being immerst, the Water immediately subsides, and stands at last at the height *DG* equal to *BF*.

From which it is manifest, that the Suspension of the Water in the former of these Experiments is not owing to the attraction of the containing Surface: since, if that were true, this Surface being the same, when the Tube is inverted, would suspend the Water at the same height.

Having shown the insufficiency of this Hypothesis, I come now to the real Cause of that Phenomenon, which is the attraction of the Periphery, or Section of the Surface of the Tube, to which the upper Surface of the Water is contiguous and coheres.

For this is the only part of the Tube, from which the Water must recede upon its subsiding, and consequently the only one, which by the



the force of its Co-hesion, or Attraction, opposes the descent of the Water.

This likewise is a cause proportional to the Effect, which it produces; since that Periphery, and the Column suspended, are both in the same proportion as the Diameter of the Tube.

Tho' from either of these Particulars, it were easy to draw a just Demonstration, yet to put the matter out of all doubt, it may be proper to confirm this Assertion, as we have done the former, by actual Experiment.

*Fig. 5.* Let therefore  $EDC$  be a Tube, like that made use of in the 7th and 8th Experiments, except that the narrower part is of a greater length; and let  $AF$  and  $BG$  be the heights to which the Water would spontaneously rise in the two Tubes  $ED$  and  $DC$ .

*Exp. 9.* If this Tube have its wider Orifice  $C$  immerst into the Water  $AB$ , and be fill'd to any height less than the length of the wider Part, the Water will immediately subside to a Level with the point  $G$ ; but if the Surface of the contain'd Water enter never so little within the smaller Tube  $ED$ , the whole Column  $DC$  will be suspended, provided the length of that Column do not exceed the height  $AF$ .

In this Experiment it is plain, that there is nothing to sustain the Water at so great a height, except the contact of the Periphery of the lesser Tube, to which the upper Surface of the Water is contiguous. For the Tube  $DC$ , by the Supposition, is not able to support the Water at a greater height than  $BG$ .

*Exp. 10. Fig. 6.* When the same Tube is inverted, and the Water is rais'd into the lower extremity of the wider Tube  $CD$ , it immediately sinks, if the length of the suspended Column  $DH$  be greater than  $GB$ ; whereas in the Tube  $DE$  it would be suspended to the height  $AF$ . From which it manifestly appears, that the Suspension of the Column  $DH$  does not depend upon the Attraction of the Tube  $DE$ , but upon the Periphery of the wider Tube, with which its upper Surface is in contact.

For the sake of those who are pleas'd with seeing the same thing succeed in different Manners, we subjoin the two following Experiments, which are in substance the same with the 9th and 10th.

*Fig. 7.*  $ABC$  is a Siphon, in whose narrower and shorter Leg  $AB$ , if it were of a sufficient length, might be suspended a Column of Water of the height  $EF$ ; but the longer and wider Leg  $BC$  will suspend no more than a Column of the length  $GH$ .

*Exp. 11.* This Siphon being filled with Water, and held in the same Position as in the Figure, the Water will not run out at  $C$  the Orifice of the longer Leg, unless  $DC$ , the difference of the Legs  $AB$  and  $BC$ , exceed the length  $EF$ .

*Fig. 8. Exp. 12.* If the narrower Leg  $BC$  be longer than  $AB$ , the Water will run out at  $C$ , if  $DC$  the difference of the Legs exceed  $EF$ ; otherwise it will remain suspended.



In these two Experiments it is plain, that the Columns  $DC$  are suspended by the Attraction of the Peripheries at  $A$ , since their lengths are equal to  $EF$ , or to the length of the Column, which by the Supposition those Peripheries are able to support; whereas the Tubes  $BC$  will sustain Columns, whose lengths are equal to  $GH$ .

Tho' these Experiments seem to be conclusive, yet it may not be improper to prevent an Objection, which naturally presents it self, and which at first view may be thought sufficient to overturn our Theory.

*Fig. 5.* For since a Periphery of the Tube  $ED$  is able to sustain no more than a Column of the length  $AF$ , contain'd in the same Tube; how comes it to sustain a Column of the same length in the wider Tube  $DC$ , which is as much greater than the former, as the Section of the wider Tube exceeds that of the narrower?

*Fig. 6.* Again, if a Periphery of the wider Tube  $DC$  be able to sustain a Column of Water in the same Tube, of the length  $BG$ ; why will it support no more than a Column of the same length in the narrower Tube  $ED$ ?

Which Queries may likewise be made with regard to the 11th and 12th Experiments.

The Answer is easy, For the Moments of those two Columns of Water are precisely the same, as if the sustaining Tubes  $ED$  and  $CD$  were continued down to the Surface of the stagnant Water  $AB$ ; since the Velocities of the Water, where those Columns grow wider, or narrower, are to the Velocities at the attracting Peripheries, reciprocally as the different Sections of the Columns.

*Fig. 9. Exp. 13.* From which Consideration arises this remarkable Paradox, That a Vessel being given of whatsoever Form, as  $ABC$ , and containing any assignable quantity of Water, how great soever; that whole quantity of Water may be suspended above the Level, if the upper part of the Vessel  $C$  be drawn out into a capillary Tube of a sufficient Fineness.

Having discover'd the Cause of the Suspension of Water in capillary Tubes, it will not be difficult to account for the seemingly spontaneous ascent of it. For since the Water, that enters a capillary Tube as soon as its Orifice is dīpt therein, has its gravity taken off by the Attraction of the Periphery with which its upper Surface is in contact, it must necessarily rise higher, partly by the pressure of the stagnant Water, and partly by the Attraction of the Periphery immediately above that, which is already contiguous to it.

P. S. I am oblig'd to Sir Isaac Newton, and Mr. John Machin, for the following Observation, that what I call a Periphery or Section of the concave Surface of the Tube is really a small Surface; whose Basis is that Periphery, and whose height is the Distance, to which the attractive Power of the Glass is extended.



2. Soon after the foregoing Discourse was printed, came out a Book published by a Member of this Society, in which the 13th Experiment there-  
*An Objection answered by the same, v. 63. p. 1083.*  
 in related, was accounted for in the following Manner.

*If there be a Funnel, as A B C, Fig. 10. full of Water, and whose wide end stands in a Vessel of Water as B C; and the top of the Funnel A ends in a Capillary Tube open at A, the whole Water will be sustain'd: the Pillar A a by the Attraction of the Circle of Glass within the Tube, immediately above it; and all the rest of the Pillars of Water, as F f, D d, E e, G g, &c. in some measure by the Attraction of the parts of the Glass above them, as F, D, E, G; and that the small Pillars or Threads of Water D d, and E e, do not slide down to F f, and G g, and so go quite down, seems to be owing to their Cohesion with the Pillar A a, which is sustained by the Capillary Tube A: For if you break off the said Tube at D E, the whole Water will presently sink down.*

As this Solution was very different from what I had before given, and the Reputation of that Gentleman, whose great Knowledge in Experimental Philosophy is generally known, was sufficient to give weight to any of his Opinions, I thought my self under an Obligation to examine his account of the Experiment, in order either to demonstrate its insufficiency, or to retract my own Solution. Accordingly at the next meeting of the Society, I produced the following Experiment.

The Funnel, *A F G B C*, Fig. 11. whose lower part *B C F G*, was Cylindrical to a considerable height, and whose top was drawn out into a fine Tube at *A*, being filled with Water to the height *B F*, so that the Surface of the Water *F G* did not reach to the arched part of the Funnel, I touch'd the end *A* with a wet Finger, whereby a small quantity of Water being insinuated into the Capillary Tube at *A*, the Water contain'd in the Funnel was suspended above the level of the Water in the Cistern *D E*, as in the former Experiment.

In this Experiment it is manifest, that the little Columns, into which we may suppose the Cylinder of Water, *F G B C*, to be divided, are no way sustain'd by the Attraction of the arched part of the Glass above them, since they have no contact with it. Nor is there any such middle Pillar of Water, which by its contact with the Tube at top, is both sustain'd it self, and helps to support the Pillars about it. Upon the Supposition of which two Particulars that Gentleman's Solution was founded.

This Experiment may be thus accounted for. The Cylinder of Water *F G B C*, by its weight balances a part of the pressure of the Atmosphere, which is incumbent on the Water in the Cistern, and endeavours to force that Cylinder upwards. The rest of that pressure is balanced by the Spring of the Air, *A F G*, which is included between the Cylinder of Water *F G B C*, and the little Column of Water in the capillary *A*. But, as this Air by its Spring presses equally every way, it must balance as much of the pressure of the Atmosphere upon the little Column of Water at *A*, as it does of that upon the Water in the Cistern. The remainder of the pressure of the Atmosphere upon the Column of Water at *A* is sustain'd  
 by



by the force with which that Column adheres to the capillary Tube, which therefore does exactly balance the weight of the Cylinder of Water  $F G B C$ , and is the real, though not the immediate Cause of its Suspension.

The Experiment succeeds in the same manner when a Column of Quicksilver is raised into the Funnel, instead of the Column of Water  $F G B C$ , the top of the Tube being touch'd with a wet Finger as before. But then the height of the Quicksilver in the Funnel must be as much less than that of the Water, as its specifick Gravity is greater.

*The same Experiments in Vacuo, by the same, ib. p. 1085.* 3. I proceed now to examine whether the Experiments therein contain'd would succeed *in Vacuo*; and whether Water could be suspended in a wide Tube by means of a Capillary at top, at a greater height, than what it can be rais'd to by the Pressure of the Atmosphere.

In order to this, I boild some Water, and afterwards purged it of its Air by means of the Air-Pump; which being done, those Experiments all succeeded in the exhausted Receiver, in the same manner as in the open Air.

The 13th Experiment in particular was made with a Tube of about 35 Inches in length, and a quarter of an Inch Diameter, the top of it being drawn out into a fine Capillary. Which being fill'd with Water purged of its Air, as before mention'd, the whole quantity continued suspended in the exhausted Receiver.

This plainly shews, that the Success of that Experiment does not depend upon the Pressure of the Air, since the small quantity of Air left in the Receiver was by no means capable of sustaining the Water at so great a height, and consequently that the height, at which Water may be suspended in this manner, is not limited by that Pressure.

But here I must not omit taking notice of a considerable Difficulty, which presents it self to those who attentively consider this Experiment. In order to make which the better appear, it will be proper to observe what happens, when a simple Capillary Tube is fill'd with Water purg'd of Air, and inclos'd in the exhausted Receiver.

In this Case the whole Column of Water contained in the Tube  $ACB$ , Fig. 12. is suspended by the Attraction of the *Annulus* at the top of the Tube  $A$ . And though that *Annulus* does not immediately act upon any part of the water, except what is either contiguous to it, or so near as to be within the Sphere of its Attraction, which extends but to a very small distance; yet it is impossible, that any other part of the water, as for instance that at  $C$ , should part from the water above it and sink down, because its descent is oppos'd by the Attraction of the contiguous *Annulus* at  $C$ . For this being equal to the upper *Annulus* at  $A$ , is capable of sustaining a Column of water of the length  $AB$ , and consequently is more than sufficient for supporting the Column of water below it,  $CB$ . From which it is plain, that no part of the water contain'd in the Tube can possibly descend, unless the upper part, assisted by the weight of



of the Water below it, be sufficient to overcome the Attraction of the *Annulus* of Glafs at *A*.

But in such a compound Tube as that made use of in our Experiment, *Fig. 13. ACB*, the Case is very different, and it does not easily appear, why in a *Vacuum* any part of the Water in the wider part of the Tube, as for Example at *C*, should not leave that which is above it, and descend; since the *Annulus* at *C* is by much too wide to sustain a Column of Water of so great a length as *C B*.

The best answer I can give to this difficulty is, That the Cohesion between the Water contain'd in the Capillary, and that below it, is sufficient to balance the weight of the Column suspended. But how far this Cohesion may depend upon the Pressure of a Medium subtil enough to penetrate the Receiver, is worthy of Consideration. For tho' such a Medium will pervade the Pores of the Water, as well as those of the Glafs, yet it will act with its intire Pressure upon all the solid Particles, if I may so call them, of the Surface of the Water in the Cistern; whereas so many of the solid Particles of the Water in the Tube, which happen to lie directly under the solid Particles of the Water above them, will thereby be secured from this Pressure; and consequently there will be a less Pressure of this Medium upon any surface of the Water in the Tube below the Capillary, than upon an equal surface of the Water in the Cistern. So that the Column of Water suspended in the Tube may be sustain'd by the Difference between those two Pressures. This Explication seems to be favour'd by the following Experiments, which may all be accounted for in the same manner, though I shall anon mention another Cause, which contributes to the Success of the first and second.

The first I shall mention, is the famous Experiment of the Suspension of Mercury purg'd of Air, to the height of 70 or 75 Inches, in the *Torricellian Tube*, in the open Air. To which we may add the sustaining of Mercury likewise purg'd of Air within the exhausted Receiver, as related by that learned and successful Promoter of Natural Knowledge, *Monf. Papin*, in his *Continuation du Digesteur*. I forbear to mention the Suspension of Water purged of Air, in the *Vacuum*, which he describes in the same Book; because there is little difference between that Experiment and our own abovemention'd, the very top of the arched part of his Tube, which top we may suppose as small as we please, supplying the place of the fine Capillary at the top of our Tube. But we must not omit the Experiments made by the famous *Monf. Huygens*, and described by him in † *Phil. Transact.* No. 86. of the cohering of polish'd Plates with a considerable force in the exhausted Receiver; as likewise of the running of Water and Mercury, when purged of Air, through a Siphon of unequal Legs in the *Vacuum*: All which he accounts for from the same Principle, and much in the same manner, as we have used for explaining the Experiment above. As to the Existence of such a Medium, I shall content my self to refer to

† v. *Abr. Vol.*  
II. p. 24.



what has been said by our illustrious President in the Queries at the latter end of the last Edition of his Opticks:

Of the Action  
of Glass Tubes  
upon Water  
and Quickfil-  
ver, by the  
same. 16.  
p. 1088.

LV. As I have lately entertain'd the Society with some Experiments on Quicksilver, which were exactly the reverse of those made by Dr. Taylor, the late Mr. Hawksbee and my self, upon Water; by which I am now enabled to throw this whole Affair into a little System by it self, I shall beg leave to lay it down in the following Propositions, the Proof of which is contain'd in the Experiments annext.

Prop. I. *The Particles of Water attract one another.* This I think, is now universally acknowledged, and therefore needs no Demonstration; the Sphericity of the drops of Rain, and the running of two drops of Water into one another upon their Contact, manifestly proving it.

Prop. II. *The Particles of Quicksilver attract one another.* This is likewise manifest from the Spherical Figure, into which a drop of Mercury forms it self upon a Table; and from two of them immediately running together, as soon as they come to touch.

Prop. III. *Water is attracted by Glass.* This plainly appears from all the Experiments, that we have shewn upon this Subject.

Prop. IV. *Quicksilver is attracted by Glass.*

*Experiment I.* If a small Globule of Quicksilver be laid upon a clean Paper, and be touched with a piece of clean Glass; upon drawing the Glass gently away, the Quicksilver will adhere to it, and be drawn away with it. And if the Glass be lifted up from the Paper, the Quicksilver will be taken up by it, in the same manner as a piece of Iron is drawn up by the Loadstone, and will stick to the Glass by a plain Surface of a considerable breadth, in proportion to the bulk of the drop, as manifestly appears by an ordinary Microscope. Then if the Glass be held a little obliquely, the drop of Mercury will roll slowly upon its Axis along the under side of the Glass, till it comes to the end, where it will be suspended as before.

*Exp. II.* If a pretty large drop of Mercury be laid upon a Paper, and two pieces of Glass be made to touch it, one on each side; upon drawing the Glasses gently from each other, the drop of Mercury will adhere to them both, and will be visibly drawn out from a globular to an oval Shape; the longer Axis passing through the middle of those Surfaces, in which the drop touches the Glasses.

Prop. V. *The Particles of Water are more strongly attracted by Glass, than by one another.* This manifestly appears from the rising of Water in small Tubes above the Level. For when the Water begins to rise into a Capillary Tube, all the Particles of Water, which touch the small *Annulus* at the bottom of the Tube, must have quitted the contact of the other Water, and have risen contrary to their Gravity, to come into contact with the Glass. After the same manner the other Experiments of Dr. Taylor, Mr. Hawksbee and my self, upon this Subject, are easily ex-



explicable. For upon a careful Examination, it will be found in them all, that some parts of the Water quit the contact of the other Water, and join themselves to the Glafs.

Prop. VI. *The Particles of Quicksilver are more strongly attracted by one another, than by Glafs.*

*Experiment I. Fig. 5.* If a small Tube as *A B*, open at both ends, be dipt into a Glafs Vessel fill'd with Mercury, and be held close to the side of the Vessel, that the rise of the Mercury within it may appear; the Mercury will partly enter into the Tube, but will stand within it at some depth, as *C E*, below the Surface of the Quicksilver in the Vessel, *CD*; and this depth will always be reciprocally as the Diameter of the Tube.

In this Experiment a Column of Quicksilver of the height *C E* endeavours to force the Mercury higher into the Tube; and as Glafs has been already prov'd to attract Quicksilver, the Attraction of the annular Surface on the inside of the Tube, which is contiguous to the upper part of the Mercury, will likewise conspire to farther its ascent. What opposes the ascent of the Quicksilver, is the Power, by which that part of it, which endeavours to rise into the Glafs, is drawn back by the Attraction of the other Mercury, with which it is in contact laterally, and this does not only balance the Attraction of the Glafs, but likewise the weight of the Column of Mercury of the height *C E*, and consequently this Attraction is considerably stronger than the Attraction of the Glafs.

The cause therefore, that suspends the weight of the Column of Mercury *C E*, being the difference between the Attraction of the annular Surface of the Tube at *E*, and that of an equal Surface of the Quicksilver in the Cistern, from which the Mercury, that endeavours to rise into the Tube, must recede, in order to unite it self to such an annulus of the Glafs, will always be proportional to that annular Surface, or to the Diameter of the Tube. And since the Column sustain'd must be proportional to the Cause that suspends it, that Column must likewise be as the Diameter of the Tube. But the Column suspended is as the Square of the Diameter of the Tube and the height *C E* conjointly; from which it follows, that the height *C E* must be as the Diameter of the Tube reciprocally, as it is found to be by Experiment.

The Experiment of the Ascent of Water above the Level in a Capillary Tube, is just the reverse of this.

*Exp. II. Fig. 6.* Quicksilver being poured into the inverted Siphon *A C B*, one of whose Legs *A C* is narrower than the other *C B*; the height *C E*, at which the Mercury stands in the wider Leg *C B*, is greater than the height *C D*, at which it stands in the narrower Leg *C A*.

On the contrary, Water stands higher in the narrower Leg, than in the wider.



*Exp. III. Fig. 7.*  $A B C D$  represents a rectangular plane of Glass, which makes one side of a wooden Box. On the inside of this is another Glass Plane of the same size, which at the end  $A C$  is prest close to the former, and opens to a small Angle at the opposite end  $B D$ . When Mercury is pour'd into this Box to any height as  $C E$ , it insinuates it self between the two Glass Planes, and rising to different heights between the Glasses where the opening is greater or less, it forms the common Hyperbola  $C G F$ ; one of whose Asymptotes  $E F$  is the line on which the Surface of the Mercury in the Box touches the inner Glass; the other is the line  $A C$ , in which the Planes are join'd. This Hyperbola being carefully examined by Mr. *Hawksbee* and my self, the Rectangle  $E H G$ , wheresoever taken, proved always equal to itself, to as great an accuracy as could be expected, when the Planes were opened to any considerable Angle: But when the opening was very small, the inequalities of the Planes, though the best I could procure, bearing a greater proportion than before to the distance between them, occasioned a sensible Variation. Which by the way, I take to be the reason, why  
† *v. sup. p. 182.* the Ordinates found by the late † Mr. *Hawksbee*, in examining the Curve produced in a contrary Situation, upon dipping two Glass Planes so join'd into Spirit of wine, do not answer to those of the Hyperbola.

*Exp. IV. Fig. 8.*  $A B$  is a perpendicular Section through two Glass Planes join'd at  $A$ , and open'd to a small Angle at  $B$ .  $C$  represents a pretty large drop of Mercury, the larger the better, which being made to descend as far as  $C$ , by holding the Planes in an erect Posture, with the end  $A$  downwards, retires from the Contact of the Planes to  $D$ , upon inclining the Planes towards an horizontal Situation; and the distance  $C D$  becomes greater or less, as the Planes are more or less inclin'd towards the Horizon.

A drop of any oily or watery Liquor moves the contrary way, as has  
† *v. sup. p. 186.* been shewn by the late † Mr. *Hawksbee*.

*Exp. V. Fig. 9.*  $A B$  is a Tube open at both ends, and a Foot or two in length, whose lower part is drawn out into a fine Capillary at  $B$ . This Tube being fill'd with Mercury, the whole Column of Quick-silver will be sustain'd in it, provided the Capillary Tube at  $B$  be sufficiently small. But if the Mercury in the end  $B$  be suffer'd to touch any other Mercury, it runs all out of the Tube. If, without letting it touch any other Mercury, a small part of the end  $B$  be broken off, the Mercury will run out, till it comes to some lesser height as  $B C$ , at which it will again stop, the height  $B C$  being nearly in a reciprocal proportion to the Diameter of the small end of the Tube.

The Seventh Experiment *p. 186.* is the Reverse of this.

*Exp. VI. Fig. 10.* Is the same in substance with the former, but made with a large Glass Funnel  $A B$ , instead of a Tube.

The Reverse of this in Water is the thirteenth Experiment, *p. 188.*

In all these Experiments it is easily seen, that the Effect is owing to the difference between the two Attractions, by which Mercury tends  
to



to Glass and to its own Body; they being always opposed to one another, so that a particular Explication is no way necessary. But perhaps it may save some little trouble to the Reader, to remove the following Objection, which will readily occur to him.

In the Experiments brought to demonstrate the fourth Proposition, the Globule of Mercury adheres to the Glass in a plane Surface, which cannot be done without encreasing the Surface of the Globule, and consequently removing some of its Particles from the contact of one another. If therefore they tend more strongly to one another than to the Glass, why do they not recede from the Glass, and assume a figure perfectly Spherical, that they may all have the greatest possible contact with each other?

To this we may answer, that the Power by which Mercury is attracted either by Glass, or by other Mercury, is proportional to the attracting Surface; and therefore, though *ceteris paribus*, the tendency of Mercury to Glass is not so strong as its tendency to other Mercury, yet in this Case a much greater number of Mercurial Particles coming into contact with the Glass, than what recede from the contact of one another, it is no wonder, that the Attraction of the Glass prevails, and causes the Globule to adhere to it. For the number of Mercurial Particles which lose their contact with the other Mercury, is no more than what makes up the difference of Surface, which arises from changing the figure of the drop: whereas the Particles, which by this means come to adhere to the Glass, are all those that constitute the plane Surface, in which the Globule touches it.

Which Consideration ought likewise to be apply'd to the Suspension of Quicksilver in Glass Tubes, either at extraordinary heights in the open Air, or at lesser heights in a *Vacuum*, as above-mentioned. For the top of the Tube being Spherical, or nearly so, it will be found, that the contact of the Mercury with the extremity of the Tube, is to the contact with other Mercury, which would be gain'd by its leaving the top of the Tube and descending a very small space, in a *Ratio* infinitely great; and consequently that the contact of the Mercury with the top of the Tube is one cause of its Suspension.

*Coroll. 1st.* From this Proposition it appears, that in a Barometer made with a narrow Tube, the Quicksilver will never stand at so great a height as in a wider. Which accounts for the *Phænomenon* so often mention'd in the yearly History of the Royal Academy of Sciences at *Paris*, by *Monf. De la Hire*; that in the Barometer, which he constantly made use of for his annual Observations, the Quicksilver did not rise so high, as in another he kept by him, by about three Lines and a half, which is near a third of an Inch our Measure: For he tells us, that the Tube of his Barometer is very small. So that there is no need to have recourse to any peculiarity either in the Quicksilver or the Glass of which that Tube was made; or to an unperceived remnant of Air left in



in the Tube, from some of which causes that Effect, and some others of the same kind were imagined to proceed.

*Cor. 2d.* In a Barometer made with a small Tube, the Mercury will rise and fall irregularly. For, as the height of the Mercury depends partly upon the Diameter of that part of the Tube that touches the upper Surface of the Mercury, it is plain, that the unavoidable inequalities in the Diameter of the Tube will be more considerable, in respect to the whole Diameter; and consequently will affect the height of the Mercury more in a small Tube than in a wider. And this I take to be the reason, why it is so very difficult, not to say impossible, to make two Barometers which shall exactly agree in the height of the Quicksilver in all Constitutions of the Air, especially if the Tubes be very narrow. This irregularity is still more considerable in the Pendent Barometer, in which the Quicksilver moves through a large space, in order to make a small Alteration in the length of the Column suspended. The same Consideration is easily extended to those Levels, that depend upon the rising of Mercury to the same height in the opposite Legs of a bent Tube; an Instrument of which kind has been lately offer'd for the service of the Publick. And as the Effect is just contrary in Levels made with Water or Spirit of Wine, due regard ought to be had to this Property in the Construction of those Instruments, by making the Tubes sufficiently wide, in order to diminish the Error as much as possible.

*Of the Freezing  
of common Water,  
and purg'd  
of Air. by Mr.  
Hawksbee,  
n. 320. p. 304.  
Plate 5. Fig. 13.*

LVI. 1. This Experiment was recommended to me, in order to discover what difference would happen in the swelling or bulk of Ice, producible on the Freezing of common Water, and Water purg'd of Air. Accordingly I procur'd a couple of Glasses, in form of Figure 13. when fill'd with the different Waters to a determinate These, height, supposing at  $a, a$ , I convey'd into the Freezing Mixture, (which was nothing else but a Composition of Snow and Bay-Salt powder'd pretty fine) where they did not remain above three or four Minutes of time, before the Congelation began in each of them, which was very discernible, by the ascent of the Water in their respective Tubes, above their first heights  $a, a$ ; and in about an Hours time, it had ascended in that Glass, which contain'd the Water purg'd of Air, at least 6 Inches; but in the other Glass with common Water, not so much by more than an Inch; there being such a Disparity in the Content of the two Glasses, the last mention'd being less by a fifth part than the other, which contained not full four Ounces. It was observable, that during the Glasses continuance in the Frigorifick Mixture, small Bubbles of Air did continually ascend in that which was filled with common Water, but not the least sign of any such appearance in the other. When I had taken them out of the premention'd Mixture, (which was at something more than an Hours time from their first putting in) I pour'd from them the Unfrozen Water, which gave me the Liberty



Liberty of discovering the various forms the new made Ice had shot it self into. That Glafs which contain'd the purg'd Water, appearing all over the Sides and upper part of it, to the very Neck, *b b*, of divers Figures, much refembling thofe of Salts. The bottom part of it *c c*, discover'd it felf to be feemingly folid, but whitifh, as if it was full of very minute interperft Vacuities; but not like thofe Cavities, which are very obfervable in the Freezing of common Water; and what was very notable, at the Bottom of the other Glafs they appear'd in great Numbers, of a longifh Form, feemingly pointing all round from the Circumference to the Centre of it. There were none of thofe premention'd Salt-like Figures on the fides of this, as the other, but it was almoft clear from any Adherence of Ice, faving towards the upper part near the Neck, where a little had faften'd it felf with thofe longifh Bubbles, pointing from that part downwards, inclining to the Centre. From all which I cannot but conclude, that the Ice produc'd from the Water purg'd of Air, was equally augmented in its Bulk to the Quantity of Water from which it was produc'd, as that which proceeded from the frozen common Water; for had the Glaffes been of an equal Content, I fee no reason to doubt, but the Water would have been equally frozen in both, and the afcent of the unfrozen part of them would have been much the fame in their Tubes. But if there be any difference, the Water purg'd of Air feems to claim the eafieft Difpofition to be frozen.

To purge it from Air, I firft-boyl'd it well over the Fire; afterwards I included it *in Vacuo*, where it remain'd in that State till it was cold; from when I took it, and proceeded prefently on the Experiment, which on two Tryals fucceeded alike.

2. The Liquid is a very deep Red; a fmall quantity of which will tinge twenty times as much of common Water of a very good Sanguine colour hardly Transparent. I found this Liquor would not freeze; during the coldeft Weather we have lately had, it retain'd its Fluidity; and when it was mixt with Water, and expos'd to freeze, the Water in which it was mixt, foon fuffer'd a Congelation; and fo much of it as underwent the Change, appear'd of a fine but pale Transparent Red; the Body of the colour retiring into the middle, in form of the Figure *aa*, and was wholly Opake. And when no more of the mixt Liquid would be frozen, I took the Body of Ice out of the Glafs that contain'd it, by juft warming the fides of it by a Fire. I found then by pricking a piece of wire into the dark part of it, the red Liquor immediately fucceeded through the Hole I had made, feemingly as pure and as abftracted from any Mixture of water, as it was before it was put into it. This red Liquor I found to be fomething fpecifically heavier than common water; which makes me wonder, why the Figure it made on its retiring, was not rather the reverse to what it appear'd: For I fhould think it reasonable to expect, that the upper part, which was the broadeft, fhould, by its own Weight, alter or reverse the Pofition of the Figure. Another thing very remarkable, was, that this

*Of the freezing of common Water, Ting'd with a Liquid, fald to be extracted from Shell-Lac. ib. p. 304. Fig. 14. Plate 5.*

retir'd



retir'd Liquid, as it seem'd to keep an equal distance from the sides of the Glafs, so did it from the bottom and top of it; which upon repeated Tryals answer'd the same.

I likewise mixt some common Water with a strong purple Liquor, made from Logwood, boyl'd in Water, in which some Allom had been dissolv'd. A little of this would give a strong Tincture to a pretty Quantity of fair Water; and when expos'd to freeze, would retire towards the middle, leaving the first frozen Water of a very pale Purple, in Comparison to the middle part; which when I had taken out of the Glafs that contain'd it, and broke it, I found 'twas frozen through, but of so dark a Colour in the middle, that it came near a black.

Of the Motion  
of Pendulums  
in Vacuo, by  
Mr. Delham,  
n. 294. p. 1785.

LVII. In order to know, whether there be any or what difference between the Vibration of Pendulums in *Vacuo*, and the open Air. I took an Air Pump; a small Movement with a Pendulum of about 10 Inches that vibrates half Seconds, and is driven by the power of a Spring; and a very well regulated Month-piece that vibrates Seconds all the Year with as much Exactness as most do.

The Result of many repeated Experiments, Day after Day, was, That in *Vacuo* the Vibrations were always larger, than in the Receiver unexhausted. At the first, when my little Movement was newly cleaned, the Vibrations were above  $\frac{3}{4}$  of an Inch larger than in the free Air. But afterwards (I suppose from some of the fouled Oil of the Pump spirtled on the Wheels, in letting in the Air, whereby the force of the Spring on the Pallets was blunted, from hence I say) as the Vibrations in the unexhausted Receiver were a little contracted, so in the Receiver exhausted they were more contracted, and only about 0,25 of an Inch larger than in the free Air.

The *Alteration* in Time, which this difference of the Vibrations produced, was constantly only about two Seconds in an Hour slower, in the Receiver exhausted, than in it unexhausted. For if in 4, 5 or more Hours going, the two Pendulums did not vary a quarter of a Second in the open Air, or when the Receiver was put over the little Movement, (but unexhausted;) yet when the Receiver was exhausted, the Half-Second Movement would lose, at the rate of two Seconds in every Hour, in every Experiment, in many Hours going.

And because I was minded to see what Alterations would arise from varying the Vibrations, therefore by opening and shutting the Pallets, I caused the Vibrations in some Experiments to be as large as the Receiver would bear; in others, to be as short as possible; always adjusting the Pendulum to vibrate Half-Seconds nicely in the Air. But still the Success was much the same, or the difference scarce perceptible. But only I imagined when the Pendulum vibrated but a little way from the Perpendicular, that the Vibrations in *Vacuo* were not so much enlarged, as when it vibrated in a larger Arch.



In all these Experiments (which were repeated divers times with the same Success) I had no reason to move me to think, but that the Vibrations were enlarged in *Vacuo* by the vast Rarefaction of the *Medium*: I had I say no reason but this, That perhaps the different state of the Air might alter the force of the Spring, which drove the Movement. For the tryal of this, I put a well adjusted *Pocket-Watch* (with *Hook's* Regulator, i. e. the common small Spiral Spring to the Ballance) into the *Vacuum*. And after several Tryals, at the same pitch of the Spring, I found not the least Alteration in the Watches going in many Hours; neither the Springs, nor any other part of the Watch seeming to be in the least affected by the *Vacuum*: but the Ballance circumvolving, or keeping the same Turns, as in the open Air.

But to be still more sure, if possible; it came after this into my Thoughts, to try what the Success would be by putting the Half-Seconds Pendulum again into the Receiver, and only pumping out a part of the Air. And accordingly I left no more Air in, than what kept the included Mercurial Gauge at about 6 Inches height. The Event of which was, That the Vibrations were then not above  $\frac{1}{10}$  Inch larger on each side, than in the Receiver unexhausted: and the Time lost, but about half a second in an Hour, or  $\frac{3}{4}$  at most. And so, according as the Mercurial Gauge was more or less high, I always found the Vibrations greater or lesser; they gradually decreasing, according to the quantity of Air re-admitted.

I shall draw some Inferences from what hath been said,

1. What Mr. *Boyl* long since observed (from a Cock'd Pistol going down as fiercely in his *Vacuum*, as in the Air) may be hereby farther confirmed, viz. That the Air is not the Cause of the Motion of Restitution in solid Bodies, as Springs. For if it was, it would certainly have been discovered in so tender an Instrument as a well adjusted *Pocket-Watch*, lying under the perpetual Influence of two Springs.

2. As in *Vacuo* (where the pressure of the Atmosphere is taken off) Heavy Bodies descend quicker than they do in the open Air: So it may be observed, That Pendulums move swifter in the Receiver exhausted, than in it unexhausted.

That heavy Bodies descend quicker in *Vacuo*, is evident from the swift Descent of the less heavy Bodies, as *Cork*, the *Down of Sowthistles*, the *lightest Feather*, &c. which do all precipitantly descend, like a Stone, in a tall exhausted Receiver.

And that the *Pendulum*, in our Experiment, moved faster in *Vacuo*, is manifest from its vibrating but two Seconds in an Hour slower, when the Vibrations were  $\frac{1}{5}$  of an Inch on a side, enlarged by the highest Rarefaction of the Air. Whereas I find by Experiment, that near the same encrease of the Vibrations doth, in the open Air, make the Pendulum go 6 or more Seconds slower in an Hour. I say near the same encrease, because it is scarce possible to manage the Pallets so, as nicely to make the same Vibrations as were in *Vacuo*.

3. The



3. The last thing I shall deduce shall be by way of Query, *viz.* Whether the Variations of Pendulums observed under the Equinoctial, and between the Tropicks, do not arise as much or more from the rarity of the *Medium*, and the encrease of the Vibrations consequent thereupon? It is scarce I think to be doubted, but that the Air is much thinner, and finer near the Line, than it is without the Tropicks. And it is evident from the Barometer, that on the tops of high Mountains the Atmosphere gravitateth less than nearer the Center. And therefore (although I like the Notion of the Decrease of Gravity from the Encrease of the distance from the Earth's Center; I say, although I like this too well to discard it, yet) I am apt to think that this is not the only reason of the *Phænomenon*.

I wish therefore that Dr. *Halley*, when he observ'd at *St. Helena* his Clocks to go slower than in *England*, had at the same time observed whether the Vibrations were not enlarged. It might be therefore very well worth the while for such as have opportunity, to take notice, Whether their Pendulums between the Tropicks do not make larger Arches than in higher Latitudes? Also in what Latitude they begin to alter? Whether the Vibration be greater near the Line, than in any other part between the Tropicks? Or whether the greatest encrease be not always in those places where the Sun passeth their *Zenith*? If the Vibrations be found larger under the Line, or in any other part of the Torrid Zone, then it may be observed, how much larger they are, and in what proportion they encrease, or decrease, by approaching nearer unto, or receding from the place of their greatest Encrease?

Also it may be worth observing, Whether Pendulums do not vary on the tops of high places, or in different states of the Atmosphere, according as the *Mercury* is high or low in the Barometer? But then in this, and indeed in the former Cases, it is necessary, or at least very expedient, that the Movement be so exactly well made, that the Power, whether Weight or Spring, do at all times exert the very same force upon the Pads or Pallets. Which is very rarely met with. For most Clocks are apt to vibrate sometimes larger, sometimes lesser Arches in the 24 Hours, according as the Weight or Spring doth more or less exert its forces on the Work.

An Experiment to prove an interspers'd Vacuum by Dr. Desaguliers, n. 354. p. 717.

LVIII. I contriv'd a Machine for the purpose, which consisted of a strong wooden Frame 15 Foot high, that held the Air-Pump, and four Cylindric Glafs-Receivers of about two Foot long each, and six Inches Diameter: Of these, having set the first upon the Air-Pump Plate, I laid on the top of it a brass Plate of seven Inches Diameter, that had an oil'd Leather fix'd to it above and below, with an Hole through the middle, of between four and five Inches Diameter; then on that Plate I set the next Receiver, with a like Plate at top; and after the same manner fix'd the other two with Plates between them: The upper Receiver being a little narrower at the Neck, went into the Hole of a Board, whereby



whereby it was screw'd down pretty hard on the other Glasses, and fix'd to the whole Machine. On the top of this upper Receiver I laid the Brass Plate, wet Leather, and Brass Springs which contain'd the Bodies to be dropt.

The whole Machine being fix'd, we first let fall a Guinea and two Papers; the one plac'd over, and the other under it, (before any Air was pump'd out) and the Guinea came to the bottom when the Papers were only in the middle of the second Glas from the Top. Then having laid a Feather on the Brass-Springs close by the Guinea, we let them loose both together; and the Feather was fallen only down to the 4th part of the Length of the first Glas or  $\frac{1}{6}$  of the whole Distance, when the Guinea was got down to the bottom of the Receiver. We then laid two Papers and two Feathers, one of each under, and the other over the Guinea between the Springs; and having drawn out so much of the Air as to bring up the Mercury in the Gage-Tube within a quarter of an Inch of the greatest Height to which it could be then rais'd by the Pressure of the external Air, we caus'd the Bodies to fall all at once; And though the Papers came down to the bottom at the same time as the Guinea, yet the Feathers, being much lighter, wanted about three Inches. But at last, having laid the Papers, Feathers, and Guinea as before, we pump'd out all the Air, and then the Feathers, as well as the Papers, came to the Bottom of the Receiver at the same instant of time as the Guinea.

LIX. 1. It appears by the Barometer, that when it rains, or a little before Rain, the Air commonly becomes lighter. That it must rain when the Air becomes lighter it is easy to imagine; for the imperceivable Particles of Water, that swim about in the Air in prodigious Quantity, not being sufficiently sustain'd when the Air has lost a certain Degree of its Weight, begin to fall, and several of them joining together in the Fall, make Drops of Rain. So when about half of the Air is drawn out of the Recipient of the Air-Pump, (and consequently the remaining Air is as weak again as at first) something like a small Rain falls. But why shou'd the Air become lighter? One might imagine that in the Place where it rains, it may have lost some of its Weight and Bulk, by means of the Winds carrying away some part of it: but Monsieur *Leibnitz*, in a Letter to the Abbot *Bignon*, gives a more ingenious and more new Reason for it.

He pretends that a Body, which is in a Liquid, weighs with that Liquid, and makes up part of its whole Weight, so long as it is sustain'd in it; but if it ceases to be sustain'd, and consequently falls, its Weight no longer makes a part of the Weight of the Liquid, which thereby comes to weigh less. This may naturally be applied to the abovemention'd Particles of Water; they encrease the Weight of the Air when it sustains them, which is diminished when it lets them fall: and as it may often happen that the Particles of Water that are highest, fall a

*Cause of the Variation of the Barometer, from the Hist. Ac.Sc. n. 351. p. 570.*

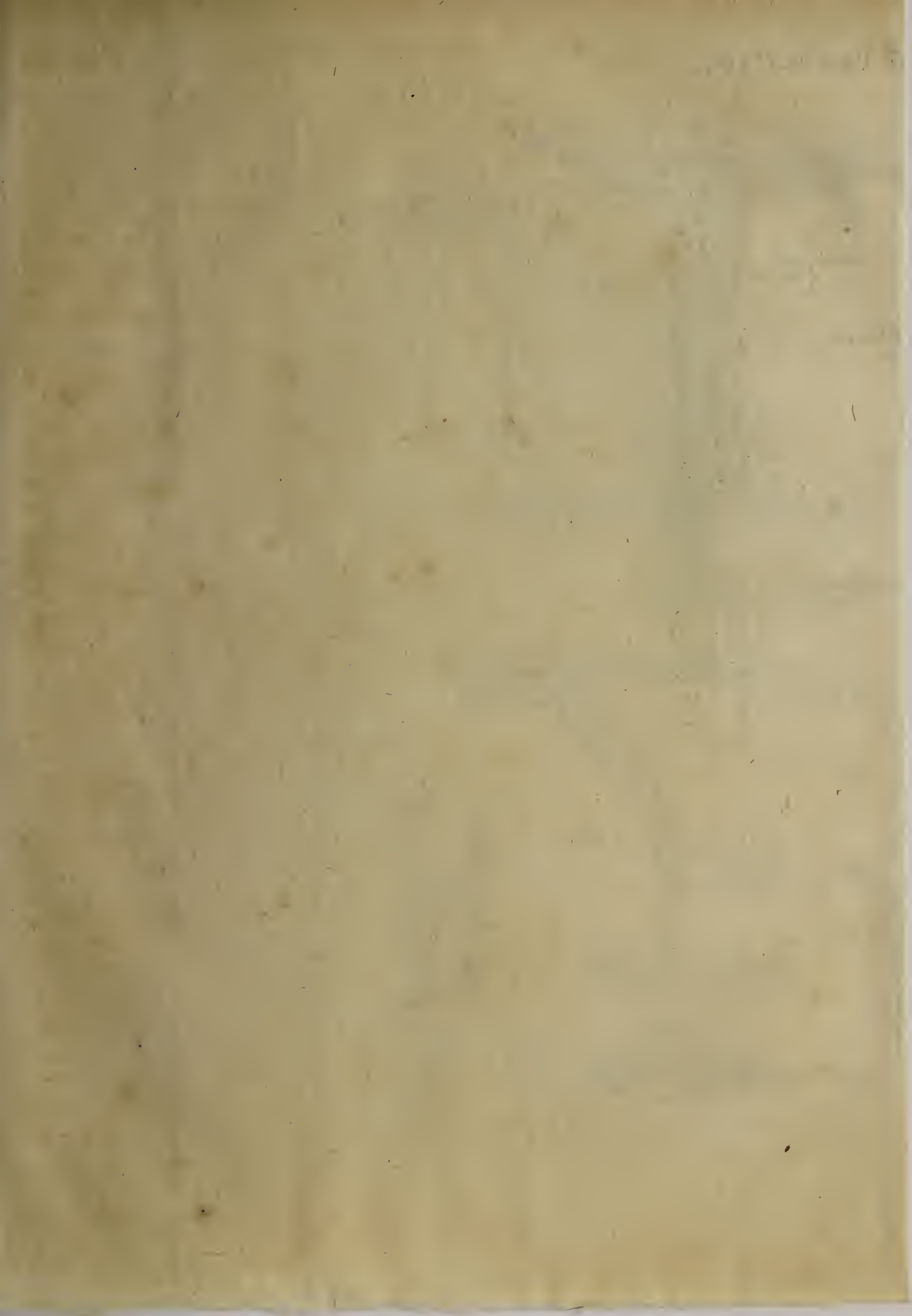


considerable time before they join with those that are below, the Gravity of the Air diminishes before it rains, and the Barometer shews it. This new Principle of Monsieur *Leibnitz* is surprizing. For must not a strange Body, whether sustain'd in a Liquid or not, always weigh? Can it gravitate upon any other bottom than that which sustains the whole Liquor? Does that bottom cease to carry a strange Body, because it falls? And is not that Body, all the while it is falling, part of the said Liquid as to the Weight? At that rate, whilst a Chymical Precipitation is made, the whole Matter ought to weigh less, which has never been observed, and scarce appears credible.

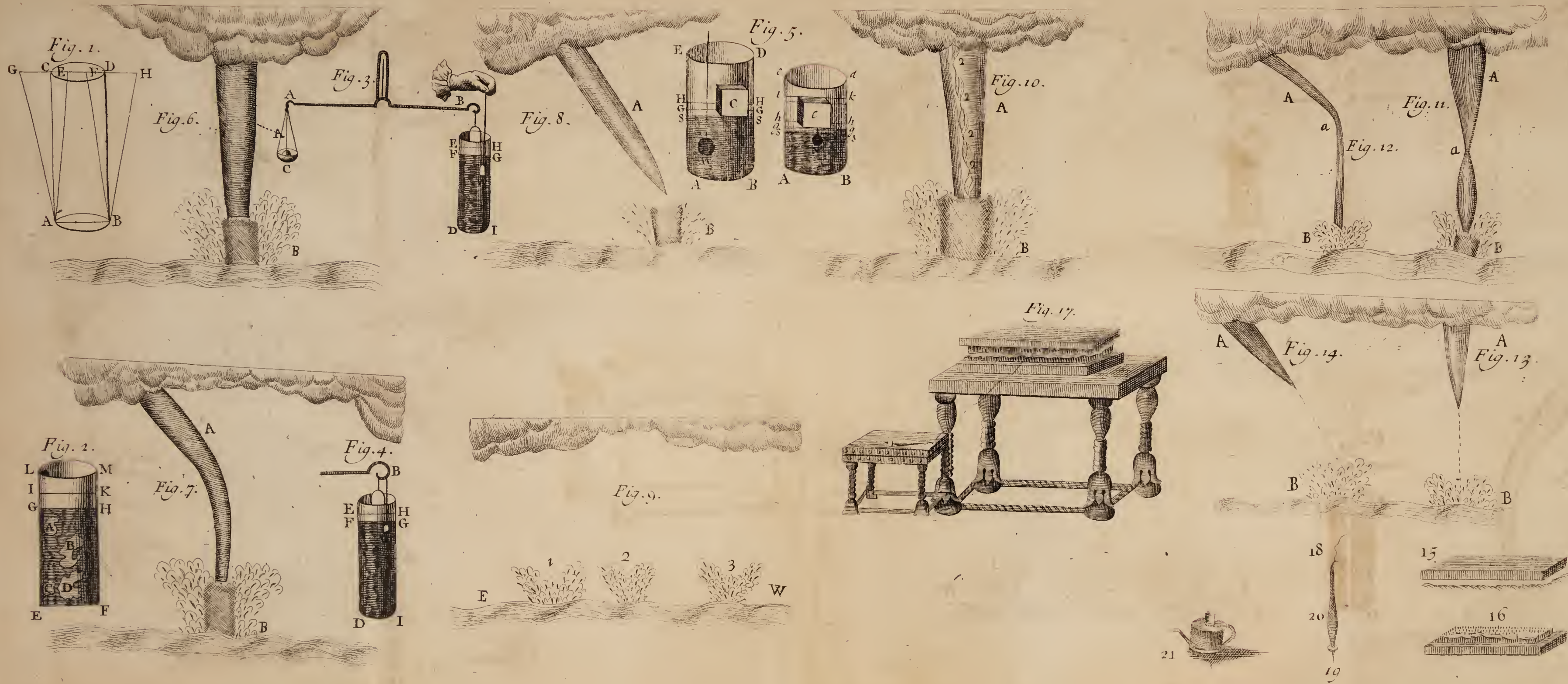
Notwithstanding these Objections the Principle holds good, when more closely examin'd. What sustains a heavy Body is press'd by it. A Table, for Example, which sustains a Pound Weight of Iron, is press'd by it, and is so only because it sustains the whole Action and Effect of the Cause of Gravity, (whatever it be) to push that Lump of Iron lower. If the Table shou'd yield to the Action of that Cause of the Weight (or Gravity) it would not be press'd, and therefore would carry nothing. After the same manner the bottom of a Vessel, which contains a Liquid, opposes it self to all the Action of the Cause of Gravity against the said Liquid: If a strange Body swims in it, the bottom opposes it self also to the said Action against that Body, which, being in *Æquilibrio* with the Liquid, is in that respect really a part of it. Thus the bottom is press'd both by the Liquid and the strange Body, and sustains them both. But if the Body falls, it yields to the Action of Gravity, and consequently the bottom does no longer sustain it; neither will it sustain it, till the said Body is come down to the bottom. Therefore during the whole Time of the Fall, the bottom is eased of the Weight of that Body, which is no longer sustain'd by any thing, but push'd down by the Cause of Gravity, to which nothing hinders it from yielding.

Monsieur *Leibnitz* to confirm his Notion, propos'd an Experiment. He says, That two Bodies must be tied to the two Ends of a Thread, the one heavier, and the other lighter than Water, yet such as both together may swim in Water: Put them into a Tube full of Water, the Tube being tied to one End of the Beam of a Ballance whose other End has a counterpoising Weight: Then if we cut the Thread which ties the Bodies together (that are of unequal Weight) so that the heaviest may presently descend, He says, That in such a Case the Tube would be no longer in *Æquilibrio*, but its counterpoising Weight wou'd preponderate, because the bottom of the Tube wou'd be less press'd. It is plain, that the Tube must be sufficiently long, that the falling Body may not reach the bottom before the Tube has time to rise. In Chymical Precipitations, the Vessels are either too short, or what is precipitated falls sometimes too fast, and sometimes too slow; for then the little Bodies are always (as to Sense) in *Æquilibrio* with the Liquor that contains them.











Monfieur *Ramazzini*, the famous Profeflor at *Padua*, to whom Monfieur *Leibnitz* had propofed his Experiment, has made it with Succefs, after fome fruitlefs Trials. Monfieur *Reaumur* (to whom the Academy had recommended it) has alfo made it with Succefs: This is a new View in Natural Philofophy, which, tho' it depends upon a well known Principle, is very fubtle and far-fetch'd; and gives us juft Reason to fear that in Subjects that feem to be exhausted, feveral things may yet efcape us.

2. *Fig. 1.* Let  $AB$  be the bottom of a Veffel full of any Fluid, whose top is either wider than the bottom as  $GE$ , narrower as  $EF$ , or equal to it as  $CD$ . The Prefsure of the Fluid upon the Bafe  $AB$  will be equal to the Weight of  $CB$ , or of a Cylinder or Prism of the fame Fluid, made up of the Area of the Bafe multiplied into the perpendicular Height above it.

*Remarks by Dr. Desaguliers, ib. p. 573. Plate 7.*

If the Fluid be equally denfe every way as Water, or of a Denfity uniformly diminifhed as you go upwards, this Proposition (call'd by Mr. *Boyle* the Hydroftatical Paradox) will hold good. This is demonftrated by all Hydroftatical Writers.

*Fig. 2.* Let  $EF$  represent part of the Surface of the Earth, and  $GEFH$  a Pillar of the Atmosphere, whose Height is  $GE$  the whole Height of the Air. Let us imagine the Vapours rifing out of the Earth to form themfelves into two Clouds  $A$  and  $B$ , and to fettle in that Place where the Air is of the fame fpecifick Gravity with themfelves. It is evident that they will caufe the Air to rife fo much higher as their Bulk amounts to, and will therefore make the Surface which was at  $GH$  to rife up to  $IK$ , fo that the bottom  $EF$ , which was prefs'd by a Pillar of Air as  $GEFH$ , is now prefs'd by an higher Pillar as  $IEFK$ . Now if the Clouds  $A, B$ , by any Cause foever, change their Place, fo as to come downwards, (for Example to  $C, D$ ) the Height of the Pillar  $IEFK$  will remain the fame as it was, and therefore the bottom  $EF$  will be prefs'd as before: by the foregoing Proposition.

*Cor. I.* If the Clouds  $A, B$  defcend, and in their Defcent keep the fame Bulk as they had before, the Surface  $IK$  will remain the fame, and therefore  $EF$  will be prefs'd as before.

*Cor. II.* Whether a Body be fpecifically lighter or fpecifically heavier than a Fluid; fo long as it is detain'd in it, it will add to the Fluid as much Weight as the Weight of an equal Bulk of that Fluid: wherefore a Body does not lofe all that Weight which it added to the whole Weight of the Fluid, when it ceafes to be fustain'd in the faid Fluid: contrary to Monfieur *Leibnitz's* Principle.

*Scholium.* If a Cloud (by any Cause whatfoever) becomes fpecifically heavier than that Part of the Air in which it fwims, the Excefs of its Gravity above an equal Bulk of Air will make it defcend, and accelerate its motion downwards; and then indeed it will lofe of its weight by the Refiftance of the Medium, till it comes to an uniform (or fenfibly uniform) Motion: but all the Weight that it will lofe, will only be the



Excess of its Gravity above that of the Air; for with the rest of its Weight it will still make up part of the Weight of the Air.

*Exp. I. Fig. 3.* Having with a Weight in the Scale *C* of the Balance *A B* counterpois'd the long Glass of Water *E I*, with a Horse-Hair I let down the leaden Weight *W* into the Water, which from *F G* arose up to *E H*; and therefore the Water became heavier by the Weight of a Bulk of Water equal to the Lead. Having with another Weight in *C* made up the Counterpoise to the whole, with fine Scissars I cut the Thread of the Plummet; and all the while the Plummet was falling, the Water descended rather than rose; and when the Lead was at the bottom, the Water overpois'd, because it had then added to it all the Excess of Weight of the Lead above an equal Bulk of Water, which by Experiment is about  $\frac{1}{11}$  of its Weight. Had Messieurs *Reaumur* and *Ramazzini* tri'd the Experiment thus, the Success had been the same; but Mr. *Ramazzini* (as I understood from a Gentleman who was present) tried it in the following Manner, as I have since done.

*Exp. II. Fig. 4.* Making use of the abovemention'd Machine, after I had balanc'd the Water and Lead in it, I fix'd to the End of the Beam *B* the Thread of the Plummet, which in the former Experiment I held in my Hand. This added to the Weight hanging at *B*, and oblig'd me to put into the other Scale a Weight equal to  $\frac{1}{11}$  of the Lead, to recover the *Æquilibrium*. Then cutting the Thread or Hair, the Scale with the Weights overpois'd whilst the Lead was falling; but the *Æquilibrium* was restor'd when it came to the bottom. So that the Lead even then must have lost only its Excess of Weight above Water.

*Exp. III. Fig. 5.* I tried the Way propos'd by Monsieur *Leibnitz* in the following Manner.

I took a Cork *C* weighing an Ounce, and something more than four times lighter than an equal Bulk of Water, and a Ball of Antimony *W* about four times specifically heavier than Water, and of four Ounces Weight. The Cork laid upon the Water in the Vessel *E A B D*, rais'd the Water from *S S* to *G G*, and added an Ounce to the Weight of the whole Water: then suspending the Ball of Antimony by a String, and letting it hang in the Water at *N*, it rais'd the Water from *G G* to *HH*, and so added another Ounce to the weight of the water. Then tying the Antimony to the Cork. (See the Figure of the Vessel mark'd with little Letters) the Cork had added to it three Quarters of the weight of Antimony which the Hand before had sustain'd, and made it sink so as to be almost cover'd, and rais'd the water to *ik*, adding three Ounces to its weight. Hanging this Vessel of water upon the Balance, and a Counterpoise at the other End, upon cutting the String, the Vessel of water was rais'd up, and the *Æquilibrium* was not restor'd till the Antimony came to the bottom.

By observing that as the Cork (being freed from the weight of the Antimony) arose, and that during the Fall of the Body, the water sunk to *h h*, it appears that this is, in effect, the same Experiment as the



the former and concludes no more. As to the real Cause of the Variation of the Barometer, namely, the Accumulation of the Air by Winds over the Place where the Barometer rises; and part of the Air being blown away where the Mercury in the Barometer sinks, see *Phil. Transf.* N. 181.

In making the first Experiment before the *Royal Society*, of a piece of Lead suspended by a Thread, whilst it was wholly cover'd with Water in the large Tube in which it hung (whose Length was 4 Feet) it was observable, not only that the End of the Balance (to which the Tube of Water with the Lead in it was fix'd) did not rise when the Thread was cut, (to let the Lead fall from the top to the bottom of the Tube) as it must have done according to Mr. *Leibnitz's* Principle; but that the said End of the Balance began to descend from the Time that the Lead began to fall. Therefore to be sure that it was not the Plummet rubbing against the Sides of the Tube in its Fall, which caused that *Phænomenon*; I hung to the Balance a long Glass of three Inches diameter instead of the Tube, and making the Experiment as before, it succeeded in the same manner: the End of the Balance which carried the Vessel of Water sunk as soon as the Thread of the Plummet was cut; though this Glass was not above half so long as the Tube. When by holding the String I drew the Lead upwards and downwards in the Water, there was no sensible Alteration of the *Æquilibrium*. Neither was it alter'd by cutting the String of a Stone-Plummet, because of the Shortness of the Glass, and the little Excess of specifick Gravity in the Stone: for the greater the Difference is betwixt the Body made use of in this Experiment and Water, as well as the bigger the Body it self is, the better the Experiment will succeed.

Hence it appears, that when a Body, specifically heavier than a Fluid, is (by what cause soever) detain'd in any Place of the said Fluid, it adds as much to the Weight of the whole Fluid, as an equal Bulk of the said Fluid amounts to: And when the said Body, by the Action of its Excess of specifick Gravity above the Fluid, descends with an accelerated Motion; so long as that Motion is accelerated, the Resistance of the Fluid (which is as the Square of the Velocity) takes off something of the whole Weight of the Body; but as much as the Body loses, so much the Water gains, over and above what was given it by its rising on Account of the immers'd Body: A Body therefore that falls in a Fluid is so far from making the Fluid lighter as it falls, that it makes it press more upon the Bottom that sustains it, when it is falling, than when it was at rest in the Fluid.

If the Vessel of Water be long enough for the falling Body to come to an uniform Motion before it reaches the bottom, the Force impress'd on the Water under the Body will make it press the bottom, as much as if the Body were actually at bottom; the Body in that Case losing all its Excess of Gravity above that of the Water, and the Water gaining it. Hence it follows, That a falling Cloud, when it comes to an uniform Motion, will not only add to the Weight of the Air as much as the

Weight



Weight of an equal Bulk of Air; but even as much as its whole Weight amounts to, though it be specifically heavier than the Air about it.

All the Diminution of Weight that can be allow'd in this Case is this. If we imagine the Air to have a smooth, regular Surface as we have at first supposed, (or if that be not allow'd, we may take any imaginary Surface of it above the Clouds) when a falling Cloud is diminish'd in Bulk, (as when it is chang'd into Rain) the Surface of the Air will subside in proportion to that Diminution, and therefore will weigh less, by so much as is the Weight of a Quantity of Air equal to the Bulk that Cloud has lost: But when the Drops of Rain after their Acceleration (occasioned by their Excess of Gravity above that of the Air) are come to an uniform Motion by the Resistance of the Air, they restore to the Air the Weight that it had lost. Now this uniform Motion being acquir'd in about two Seconds of Time, and the Diminution of Gravity in the Air being insensible, when compared to near three Inches of Mercury (for such is the Variation of the Barometer with us) can no way be the occasion of those so sensible Alterations in it, which happen some time before Rain or fair Weather. Add to this that the whole Quantity of Rain that falls in *England* and *France*, in the space of one Year, scarce ever equals two Inches of *Mercury*: And in most Places between the Tropicks, the Rains fall, and at certain Seasons, in very great Quantities, and yet the Barometer shews there very little or no Alteration.

LX. Papers omitted.

The following Papers which are printed by Mr. *Hawksbee* in his *Physico-Mechanical Experiments*.

- n. 292. p. 1629. 1. An Experiment to shew the Cause of the Descent of the Mercury in a Barometer in a Storm.
- n. 295. p. 1806. 2. An Experiment of firing Gun-powder on a red hot Iron in *Vacuo Boyliano*.
- ib. p. 1807. 3. An Experiment of the Qualities of Air produc'd from Gun-powder fir'd in *Vacuo Boyliano*.
- n. 296. p. 1865. 4. Experiments on the Production of Light from the *Phosphorus* in *Vacuo*.
- n. 297. p. 1902. 5. An Experiment on the Propagation of Sound in condens'd Air; with a Repetition of it in the open Field.
- ib. p. 1904. 6. An Experiment of the Diminution of Sound in Air rarify'd.
- n. 298. p. 1946. 7. Experiments on the Resilition of Bodies in condens'd Air, common Air and in *Vacuo*.
- ib. p. 1948. 8. An Experiment on the Descent of Malt Dust in an evacuated Receiver.
- n. 303. p. 2129. 9. Several Experiments on the Mercurial Phosphorus.
- n. 304. p. 2165. 10. ——— On the Attrition of Bodies in *Vacuo*.



11. An Experiment touching the Proportion of the Weight of Air, <sup>n. 305 p. 2221.</sup> to the weight of a like Bulk of Water, without knowing the Quantity of either.

12. An Experiment shewing that the Spontaneous Ascension of Water <sup>ib. p. 2223.</sup> in small Tubes open at both ends, is the same in *Vacuo*, as in the open Air.

13. Several Experiments touching the seeming spontaneous ascent of <sup>n. 319 p. 258.</sup> Water.

14. An Experiment made and repeated, touching the Production of <sup>n. 307 p. 2277.</sup> considerable Light on a slight Attrition of the Hands on a Glass-Globe exhausted of Air; with other remarkable Occurrences.

15. An Experiment touching the extraordinary Electricity of Glass, <sup>n. 308 p. 2327.</sup> producible on a smart Attrition of it; with a Continuation of Experiments on the same Subject, and other Phenomena.

16. Several Experiments shewing the strange Effects of the Effluvia <sup>n. 309 p. 2372.</sup> of Glass, producible on the Motion and Attrition of it.

17. An Experiment confirming one lately made of the Production of <sup>n. 310 p. 2413.</sup> Light by the Effluvia of one Glass falling on another in Motion.

18. An Experiment of the Difficulty of separating two Hemispheres, <sup>ib. p. 2415.</sup> upon injecting an Atmosphere of Air on their outward Surfaces, without withdrawing the included Air.

19. An Experiment of the Quantity of Air produc'd from a certain <sup>n. 311 p. 2409.</sup> Quantity of Gun-powder fir'd in common Air.

20. An Experiment shewing that the Springs or constituent parts of <sup>ib. p. 2412.</sup> Air are capable to suffer such Disorder by a violent impulse, as to require Time to recover their natural State.

21. The Repetition of an Experiment touching Motion given Bodies <sup>n. 315 p. 82.</sup> included in a Glass by the approach of a Finger near its outside; with other Experiments on the Effluvia of Glass.

22. An account of some Experiments touching the Electricity and <sup>ib. p. 87.</sup> Light producible on the Attrition of several Bodies.

23. An Experiment touching the different Density of the Air, from <sup>ib. p. 93.</sup> the greatest natural Heat to the greatest natural Cold in this Climate.

24. An account of the Success of an Attempt, to continue several Atmospheres of Air condens'd in the space of one for a considerable <sup>n. 318 p. 217.</sup> time.

25. An Experiment of the Production of Light within a Globe Glass, whose inward Surface is lin'd with Sealing-Wax, upon an Attrition of <sup>ib. p. 219.</sup> its outside.

## LXI. *An Account of a Book, Omitted.*

1. *Edm. Dickensoni*, M. D. *Physica vetus & nova vera, five Tractatus* <sup>n. 277 p. 1083.</sup> *de naturali veritate Hexameri Mosaici, per quem probatur in Historia Creationis*



Creationis, cum generationis Univerſæ methodum atque modum, tum veræ Philoſophiæ Principia ſtrictim atque breviter tradi, 4to. Lond. 1702.

## C H A P. II.

*Hydrology.*

1.  
Of the Cause of  
the Saltnefs of  
the Ocean, by  
Dr. Halley,  
n. 344. p. 296.

There have been many Attempts made and Propoſals offered, to aſcertain from the Appearances of Nature, what may have been the Antiquity of this Globe of *Earth*; on which, by the Evidence of Sacred Writ, *Mankind* has dwelt about 6000 Years; or according to the *Septuagint* above 7000. But whereas we are there told that the Formation of *Man* was the laſt Act of the Creator, 'tis no where revealed in Scripture how long the *Earth* had exiſted before this laſt Creation, nor how long thoſe five Days that preceeded it may be to be accounted; ſince we are elſewhere told, that in reſpect of the Almighty a thouſand Years is as one Day, being equally no part of *Eternity*: Nor can it well be conceived how thoſe Days ſhould be to be underſtood of natural Days, ſince they are mentioned as Meaſures of Time before the Creation of the Sun, which was not till the fourth Day. And 'tis certain *Adam* found the *Earth*, at his firſt Production, fully replenished with all ſorts of other *Animals*. This Enquiry ſeeming to me well to deſerve Conſideration, and worthy the Thoughts of the *Royal Society*, I ſhall take leave to propoſe an Expedient for determining the Age of the World by a *Medium*, as I take it, wholly new, and which in my opinion ſeems to promiſe Succeſs, though the Event cannot be judged of till after a long Period of Time; ſubmitting the ſame to their better Judgment. What ſuggeſted this *Notion* was an Obſervation I had made, that all the *Lakes* in the *World*, properly ſo called, are found to be *Salt*, ſome more ſome leſs than the Ocean Sea, which in the preſent Caſe may alſo be eſteem'd a *Lake*; ſince by that term I mean ſuch ſtanding Waters as perpetually receive Rivers running into them, and have no Exit or Evacuation.

The Number of theſe Lakes in the known Parts of the World is exceeding ſmall, and indeed upon Enquiry I cannot be certain there are in all any more than four or five, viz. Firſt, The *Caspian Sea*; Secondly, The *Mare Mortuum* or *Lacus Asphaltites*; Thirdly, The Lake on which ſtands the City of *Mexico*; and Fourthly, The Lake of *Titicaca* in *Peru*, which by a Channel of about fifty Leagues communicates with a fifth and ſmaller, call'd the Lake of *Paria*, neither of which have any other Exit. Of theſe the *Caspian*, which is by much the greateſt, is reported to be ſomewhat leſs ſalt than the Ocean. The *Lacus Asphaltites* is ſo exceedingly Salt, that its Waters ſeem fully ſated, or ſcarce capable to diſſolve any more; whence in Summer time its Banks are incruſtated with



with great Quantities of dry Salt, of somewhat a more pungent nature than the *Marine*, as having a Relish of *Sal Armoniac*; as I was inform'd by a curious Gentleman that was upon the place.

The *Lake of Mexico* properly speaking is two Lakes, divided by the *Causways* that lead to the *City*, which is built in Islands in the midst of the *Lake*, undoubtedly for its Security; after the Idea, 'tis probable, its first Founders borrowed from their *Beavers*, who build their Houses on Damms they make in the Rivers after that manner. Now that part of the *Lake* which is to the Northwards of the *Town* and *Causways*, receives a River of a considerable Magnitude, which being somewhat higher than the other, does with a small Fall exonerate it self in the Southern part, which is lower. Of these the lower is found to be salt, but to what degree I cannot yet learn; though the upper be almost fresh.

And the *Lake of Titicaca*, being near eighty Leagues in Circumference, and receiving several considerable fresh Rivers, has its Waters, by the Testimony of *Herrera* and *Acosta*, so brackish as not to be potable, though not fully so salt as that of the Ocean; and the like they affirm of that of *Paria*, into which the *Lake of Titicaca* does in part exonerate it self, and which I doubt not will be found much saltier than it, if it were enquired into.

Now I conceive that as all these Lakes do receive Rivers and have no Exite or Discharge, so 'twill be necessary that their Waters rise and cover the Land until such time as their Surfaces are sufficiently extended, so as to exhale in Vapour that Water that is poured in by the Rivers; and consequently that Lakes must be bigger or lesser according to the Quantity of the fresh Water they receive. But the Vapours thus exhaled are perfectly fresh, so that the saline Particles that are brought in by the Rivers remain behind, whilst the fresh evaporates; and hence 'tis evident that the Salt in the Lakes will be continually augmented, and the Water grow saltier and saltier. But in Lakes that have an Exit, as the *Lake of Genesaret*, otherwise call'd that of *Tiberias*, and the upper *Lake of Mexico*, and indeed in most others, the Water being continually running off, is supply'd by new fresh River Water, in which the saline Particles are so few as by no means to be perceived.

Now if this be the true Reason of the Saltnefs of these Lakes, 'tis not improbable but that the Ocean it self is become salt from the same Cause, and we are thereby furnished with an Argument for estimating the Duration of all Things from an Observation of the Increment of Saltnefs in their Waters. For if it be observed what Quantity of Salt is at present contained in a certain Weight of the Water of the *Caspian Sea*, for example, taken at a certain Place, in the dryest Weather; and after some Centuries of Years the same Weight of Water, taken in the same place and under the same Circumstances, be found to contain a sensibly greater Quantity of Salt than at the time of the first Experiment, we may by the Rule of Proportion, take an estimate of the



whole time wherein the Water would acquire the Degree of Saltnefs we at present find in it.

And this Argument would be the more conclufive, if by a like Experiment a fimilar Encrease in the Saltnefs of the *Ocean* fhould be obferv'd: for that, after the fame manner as aforefaid, receives innumerable Rivers, all which depofite their faline Particles therein; and are again fupply'd, as I have elfewhere fhewn, by the *Vapours* of the *Ocean*, which rife therefrom in Atoms of pure Water, without the leaft admixture of Salt. But the Rivers in their long Paffage over the Earth do imbibe fome of the faline Particles thereof, though in fo fmall a Quantity as not to be perceived, unlefs in thefe their Depofitories after a long Tract of Time. And if upon repeating the Experiment, after another equal number of Ages, it fhall be found that the Saltnefs is further encreafed with the fame Increment as before, then what is now propofed as *Hypothetical* would appear little lefs than *Demonftrative*. But fince this Argument can be of no ufe to ourfelves, it requiring very great Intervals of time to come to our Conclufion, it were to be wifhed that the ancient *Greek* and *Latin* Authors had delivered down to us the degree of the Saltnefs of the Sea, as it was about 2000 Years ago: for then it cannot be doubted but that the Difference between what is now found and what then was, would become very fenfible. I recommend it therefore to the Society, as Opportunity fhall offer, to procure the Experiments to be made of the present degree of Saltnefs of the Ocean, and of as many of thefe Lakes as can be come at, that they may ftand upon Record for the benefit of future Ages.

If it be objected that the Water of the Ocean, and perhaps of fome of thefe Lakes, might at the firft Beginning of Things, in fome meafure contain Salt, fo as to difturb the Proportionality of the Encrease of Saltnefs in them, I will not difpute it; but fhall obferve that fuch a Suppofition would by fo much contract the Age of the World, within the Date to be derived from the foregoing Argument, which is chiefly intended to refute the ancient Notion, fome have of late entertain'd, of the Eternity of all Things; though perhaps by it the World may be found much older than many have hitherto imagined.

A Water-Spout  
in the Downs,  
by Mr. Gordon,  
n. 270.  
p. 805.

II. The latter end of *March*, 1701. *mane*; between the Hours of 10 and 11, I obferved a remarkable *Water-Spout* in the *Downs*. It bore N. by E. off our Ship, about 2 Leagues diftance by Eftimation; the Wind at E. N. E. a Top-fail gale, and very Cold. The Horizon was intirely open and ferene, except the Northern parts thereof from N. N. W. to N. E. by E. or thereabouts. The higheft part of the Cloud appeared to make an Angle of 45 Deg. of Elevation. About one half of the Cloud, (*viz.* the upper) was very white, and the other extreamly black. The Spout itfelf, (which hung from the lower part of the whitifh Cloud) hovered up and down for about 20 Minutes, and during two or three Minutes of the time, that part of the Sea exactly under



under the Spout, did sparkle up Water to a considerable height. The sparkling run along to the Leeward, (the Cone of the Spout moving that way, and making it seems a discharge, though not visible to us in its fall) and continued running along for six Ships length. Afterwards the body of the Spout did quickly contract it self, and then disappeared. About two Hours afterwards the Heavens were intirely overcast, and during that Afternoon there fell abundance of Hail, and both Wind and Cold encreased. I have seen several Water-Spouts in the *Mediterranean Sea* some Years ago, and those usually during the time of stark Calm and hot Summer Weather; but to see one in our Northern Climate at this time of the Year, and during Weather both cold and windy, is, I presume, a little unusual.

III. The 27th of *August*, 1701. being upon the Coast of *Barbary*, to the Northward of the Town of *Bona*, upwards of 10 Leagues distance at Sea, about 7 a Clock at Night, shortly after Sun-setting appeared in the N. E. (which was directly up the Gulf of *Lyons* from us) great and continued Flashes of Lightning one after another, without hardly any Intermission, and this without Thunder continued till the next Morning; the Flashes of Lightning sometimes representing the sudden Appearance of a Star, and at other times of a Flaming Sword, and again of a Silver Cord stretched along the Clouds, or as the irregular Rents of a Vial from top to bottom. About 8 next Morning we had Thundring, with a Continuation of Lightning of the kind and appearance above-mention'd, all from the N. E. or thereby. About 9, fell down from the Clouds (which lookt dismally black, lowring, and as it were heavy with Rain) in the said N. E. Quarter, three Water-spouts (as commonly called) that in the middle being the greatest seem'd so big as the Mast of a Ship, and I judg'd it to be at least a League and a half distant from us; so that in it self no doubt it was bigger than three Masts. The other two were not by half so big. All of them black, as the Cloud from whence they fell. All of them smooth, without any knot or irregularity; only at first falling, some fell perpendicularly down, and some obliquely, and all of them smaller at the lower end than above, giving the representation of a Sword; sometimes also one of them would bow it self, and again become strait, and also sometimes became smaller, and again increased its bulk; sometimes it would disappear, and immediately fall down again; sometimes it became extenuated to the smallness of a Rope, and again became gross as before.

There was always a great boyling and flying up of the Water of the Sea, as in a *Fette d'eau*, or Water-work; or this rising of the Water had the appearance of a smoaking Chimney in a calm Day. Some Yards above the surface of the Sea the Water stood as a Column or Pillar and then spread it self, and was dissipated as Smoak: And the Sword like Spout from the Clouds either came down to the very middle of this

*Spouts in the  
Mediterranean, by  
Mr. Alex.  
Stuart, n. 277.  
p. 1077.*

Pillar,



Pillar, and as it had been joyned with it, as the greatest, which fell perpendicularly down, still did from beginning to end: Or else it pointed to this Column of Water, at some distance, either in a perpendicular or oblique Line, as did the other two lesser. There were three or four Spouts more, which appeared at the same time in the same quarter of the Heavens, but neither for bulk or duration like to these three: Those appeared or disappeared several times, during the Continuance of these three aforesaid.

It was hardly distinguishable whether the Sword like Spout fell first down from the Cloud, or the Pillar of Water rose first from the Sea, both appearing opposite to one another all of the sudden, as in the twinkling of an Eye. Only I observed of one, that the Water boyled up from the Sea to a great height, without the least appearance of a Spout pointing to it either perpendicularly or obliquely, and here the Water of the Sea never came together in the form of a Pillar or a Column, but did fly up scatteredly, the Sea being in a boiling rage round the place. The Wind being then N.E. the said Boiling advanced towards the S. W. as a flitting or moving Bush upon the surface of the Sea, and at last ceased. This proves that the boiling or flying up of the Water of the Sea may begin before the Spout from the Cloud appears to us: and indeed if there be any small matter of priority betwixt those two Appearances, the boiling or throwing up of the Sea-Water has it: Which begins first to boyl, and then frames it self into a Pillar of Water, especially on the lower part thereof.

It was observable of all of them, but more perceptible of the great one, that towards the end it began to appear like a hollow Canal, only black in the Borders, but white in the middle; and though at first it was altogether black and opaque, yet one could very distinctly perceive the Sea Water to fly up alongst the middle of this Canal, as Smoak up a Chimney, and that with great Swiftnes, and very perceptible Motion: And then shortly after the Spout or Canal brake in the middle, and disappeared by little and little, the boiling up, yea, the Pillar-like form of the Sea-Water continuing still the last, yea, for some considerable time after the Spout disappeared, and perhaps till the Spout appear'd again, or reformed it self, which it commonly did in the same place as before, breaking and forming it self again several times in a quarter of an Hour, or half an Hours time. The middle of the three, as I have said, exceeded all the rest in Bigness, Perpendicularity, Constancy of Form and Situation, as well as Duration; but at last vanished, as is above set down.

It was observable (which I had almost forgot) That the oblique Spouts pointed always from the Wind; that is, That the Wind being at N.E. the oblique Spouts always pointed to the S. W. tho' at the same time and moment there were others perpendicular, which remained still so, notwithstanding the Wind. Also that such as were curved had still the Convex side from the Wind, and the Concave towards it; that is, the



the Wind being at N. E. the Concave was towards the N. E. and the Convex towards the S. W. It rained a great deal during the Continuance of these Spouts, and after their total Disappearance we had half an Hours violent Gale of Wind from the N. E. with very little Rain, thereafter the Weather cleared up.

*Fig. 6.* *A* the Spout of a black Colour, falling out of a black Cloud perpendicularly. *B* the Water of the Sea, rising in the Form of a Pillar or Column in the middle, and scattered round about the said middle Column, in form of Smoak, or rather like the falling of a *Fette d'eau*. These two meet one another directly, and the Column of Water from the Sea is commonly groffer than the Spout from the Clouds. *Fig. 7.* *A* a curved Spout, joining with the rising Water of the Sea at *B*. *Fig. 8.* *A* represents a black Spout, falling obliquely from the Clouds of the same colour. *B* represents the ascending Column of the Sea-Water as in *Fig. 6.* with this Difference that here the Spout and Column of Water meet not. *Fig. 9.* *E* and *W* signify *East* and *West*. 1, 2, 3. represent the successive Progression of the boyling of the Sea from *East* to *West*, or from N. E. to S. W. and that without any appearance of a Spout from the Clouds, pointing to either of these Places. *Fig. 10.* *A* represents the big perpendicular Spout a little before its breaking, white in the middle. *B* the Column of Sea Water joining therewith. 2 2 2 2. the Water of the Sea, ascending in the form of Smoak up a Chimney, all alongst the Column at *B* to the Clouds. *Fig. 11.* *A* the breaking of a perpendicular Spout, commonly beginning in the middle at *A*. *B* the Rise of the Sea Water, which begins to fail, and the middle Column to disappear. *Fig. 12.* *A* an oblique Spout, which after reaching to the Sea in a Curved Line or Obtuse Angle, does shortly after break at *a*, and disappears. *B* the rising of the Sea Water also beginning to cease. *Fig. 13.* *A* a perpendicular Spout beginning to fall. *B* the beginning ascent of the Water of the Sea under it. *Fig. 14.* *A* One oblique Spout, beginning or darting it self out of the Clouds. *B* the rising or boyling of the Water, answering to it in an oblique Line.

*The Explication of the Tables. Plate 7.*

These sometimes reach down to the Sea or rising Water, and sometimes they do not reach thither, but continue a while as here represented.

IV. *August 15. 1687.* about two in the Afternoon, appear'd a Spout in the Air, in the Parish of *Hatfield*; on the noise of which I immediately run to the View thereof, and found it about a Mile off, coming directly to the Place where I was.

*A Spout in Yorkshire, by Mr. Dela Pryme, n. 281. p. 1248.*

The Season was very dry, the Weather extreme hot, and the Air very Cloudy, the Wind aloft and pretty strong; and (which is most observable and material) blowing out of several Quarters at the same time and filling the Air hereabout with mighty thick and black Clouds, Layer upon Layer: The Wind thus blowing created a great Vortex, Gyration.



Gyration and whirling among the Clouds, the Center of which every now and then dropt down in the Shape of a long thin black Pipe, commonly call'd a Spout; in which I could distinctly behold a Motion, like that of a Screw, continually drawing upwards, and screwing up, as it were, where-ever it touch'd. In its Progress it mov'd slowly over a Hedge Row and Grove of young Trees, which it made bend like Hazle Wands, in a circular Motion; then going forward to a great Barn, it did in a Minute twitch off all the Thatch, and fill the whole Air therewith. Coming to a very great Oak Tree, it made it bend like the aforegoing, and broke one of the greatest and strongest Branches thereof, that would not yield to its Fury, and twisting it about, flung it a very considerable distance off. Then coming within 300 Yards of me, I beheld with great Satisfaction its odd Phenomenon, and found it proceeded from nothing but a Gyration of the Clouds, by contrary Winds, meeting in a Point or Center, and then and there where the greatest Condensation and Gravitation was, falling down into a Pipe or great Tube, (somewhat like the *Cochlea Archimedis*) and that in its working or whirling Motion, either sucks up Water, or destroys Ships, &c. Having travelled about  $\frac{1}{4}$  of a Mile farther, it then dissolv'd by the prevalency of the Wind that came out of the East.

Another, by the  
same, n. 284.  
p. 1331.

V. Since this I have been so happy as to see another in the same place. The Weather here in this part of the Country, hath been exceeding wet and cool, yet for all that *Monday* the 21st of *June* was pretty warm; on the Afternoon of which Day, about two of the Clock, no Wind stirring below, tho' it was somewhat great in the Air, the Clouds begun to be mightily agitated and driven together; whereupon they became very black and were (most visibly) hurried round, from whence proceeded a most audible whirling noise, like that commonly heard in a Mill. After a while a long Tube or Spout came down from the Center of the congregated Clouds, in which was a swift spiral Motion like that of a Screw, or the *Cochlea Archimedis* when it is in Motion, by which spiral nature and swift turning, Water ascends up in to the one as well as into the other. It travelled slowly from West to North East, broke down a great Oak-Tree or two, frightened the Weeders out of the Field, and made others lie down flat upon their Bellies, to save being whirl'd about and killed by it, as they saw many Jackdaws to be that were suddenly catch'd up, carried out of sight, and then cast a great way off amongst the Corn; at last it pass'd over the Town of *Hatfield*, to the great terror of the Inhabitants, filling the whole Air with the Thatch that it pluck'd off from some of the Houses; then touching upon a corner of the Church, it tore up several Sheets of Lead, and roll'd them strangely together, soon after which, it dissolv'd and vanish'd without doing any further Mischief.

There was nothing more extraordinary in this, than in the other that I gave you a former account of, and by all the Observations that I could make



make of both of them, I found that had they been at Sea, and joyn'd to the surface thereof, they would have carried a vast quantity of Water up into the Clouds, and the Tubes would then have become much more strong and opake than they were, and have continued much longer. It is commonly said that at Sea the Water collects and bubbles up a Foot or two high under these Spouts before that they be joyned: But the Mistake lies in the pellucidity and fineness of those Pipes, which do most certainly touch the surface of the Sea before that any considerable Motion be made in it, and that when the Pipe begins to fill with Water, it then becomes opake and visible. As for the reason of their dissolving of themselves after that they have drunk up a great quantity of Water, I take it to be by and through the great quantity of Water that they have carried up, which must needs thicken the Clouds, and impede their Motion, and by that means dissolve the Pipes.

VI. A remarkable Spout fell on *Emott-more*, nigh *Coln* in *Lancashire*, Strange Effects of a Spout in Lancashire, by Dr. Richardson, n. 36; p. 1097. on *Tuesday* the 3d of *June*, 1718. about ten in the Morning: when several Persons who were imploy'd in digging *Peat* nigh the place where this Accident happen'd, upon a sudden were so terrify'd with an unusual noise in the Air, that they left their Work and ran Home, which was about a Mile from the Place: But to their great surprize they were intercepted by Water; for a small Brook in the Way was risen about six Foot perpendicular in a few Minutes time, and had overflown the Bridge.

It is to be observ'd, that there was no Rain at that time on *Emott-more*, only a Mist, which is very frequent upon those high Mountains in Summer-time. There was a great Darkeness in the Place where the Water fell, without either Thunder or Lightning, (as I had my Information from an Eye Witness). The Meadows at *Wicollae* were so much floated, that the like had not been seen in several Years before, though there it was a very bright Day.

Upon this account, I went to view the Place where the Water fell; though I believ'd this Inundation might proceed from an Eruption of Water out of the side of the Mountain; such being not unfrequent, where Lead or Coal have been dug, but neither have ever been sought for here. Upon approaching the Place, I was struck with unspeakable Horror, the Ground was torn up to the very Rock, where the Water fell, which was above seven Foot deep, and a deep Gulf made for above half a Mile, and vast heaps of Earth cast up on each side of it, some pieces remaining yet above twenty Foot over, and six or seven Foot thick. About ten Acres of Ground were destroy'd by this Flood. The first Breach where the Water fell is about sixty Foot over, and no appearance of any Eruption, the Ground being firm about it, and no Cavity appearing. I must not forget to mention, that the Ground on each side the Gulf was so shaken, that large *Chasms* appear'd at above 30 Foot distance,



distance, which a few Days after I observ'd the Shepherds were filling up, left their Sheep should fall into them.

*Inundations in  
Ireland, com.  
by Mr. Der-  
ham, n. 32.  
p. 309.*

VII. Mr. Neve, a very intelligent Person from *Maghraselt* in the North of *Ireland* tells me, That on *October 7. 1706.* after a very rainy Day, and Southerly Wind, there happened a prodigious *Flood* (the like not in the Memory of Man) which brake down several Bridges, and the Sides of some of the Mountains in that part of *Ireland*. That it came running down in vast Torrents from some of the Mountains, and drown'd abundance of black Cattle and Sheep, spoiled a great deal of Corn and Hay in the Stacks, that it laid abundance of Houses two or three Feet deep in the Water, and brake down several of the Forge and Mill-Dams.

*July 3, 1707.* they had another Flood, which came so suddenly from the Mountains, as if there had been some sudden Eruption of the Waters. And also on the 26th of the same Month, in the County of *Antrim*, there was a very sudden and surprizing *Flood*, which raised the Six-Mile-River (so call'd) at that rate, that it brake down two strong Stone-Bridges, and three Houses, and carried away 600 Pieces of Linnen Cloath, that lay a Bleaching, fill'd many Houses several Feet deep with Water, tore down some large Rocks in its Passage, and left several Meadows covered a Foot or two deep with Sand. That they in the South East part of the County of *Derry*, had that Day but little Rain with some Thunder: But beyond the Mountains, in the North-west part of the County, the River *Roe* had a great Flood.

*An Eruption of  
Waters in  
Craven, by  
Mr. Thoresby.  
n. 306. n. 2236.  
† Abr. Vol. II.  
p. 328.*

VIII. In † *Phil. Transact.* N°. 245. An account is given of an extraordinary Eruption of Water in *Craven*. To which may be added, that on the opening of the Rock, at the Foot whereof the Town of *Starbotham* stands, the Water gush'd out in so vast a Quantity as if it would have swept away the whole Town: The Waves came rolling down, like long Swarths of Grass one upon another, to use the Metaphor of the Relater, who had never seen the Sea. Several Houses were ruin'd, and others wreckt up to the Chamber Windows; one particularly so cover'd, that a great piece of the Rock was left upon the top of the Chimney.

*Eruption of a  
Burning Spring,  
by Mr. Hopton.  
n. 334. p. 475*

IX. A famous boyling Well at *Broseley* near *Wenlock* in the County of *Salop*, was discovered about *June, 1711.* It was first found out by a terrible uncommon Noise in the Night (about two Nights after a remarkable Day of Thunder :) The Noise was so very great, that it awak'd several People in their Beds, that liv'd hard by, who being willing to be satisfy'd what it was, rose up from their Beds; and coming to a boggy Place under a little Hill about 200 Yards off the River *Severn*, perceiv'd a mighty rumbling and shaking in the Earth, and a little boyling up of Water through the Grass. They took a Spade, and digging



digging up some part of the Earth, immediately the Water flew up a great Height, and a Candle that was in their Hand set it on Fire.

To prevent the Spring being destroy'd, there's an Iron Cistern plac'd about it, with a Cover upon it to be lock'd, and a Hole in the middle thereof, that any who come may see the Water through. If you put a lighted Candle or any thing of Fire to this Hole, the Water immediately takes Fire, and burns like Spirit of Wine or Brandy, and continues so as long as you keep the Air from it; but by taking up the Cover of the Cistern, it quickly goes out. The heat of this Fire much exceeds the heat of any Fire I ever saw, and seems to have more than ordinary fierceness with it. Some People out of Curiosity, after they have set the Water on Fire, have put a Kettle of Water over the Cistern, and in it Green Peas, or a Joint of Meat, and boyled it much sooner than over any artificial Fire that can be made. If you put green Boughs, or any thing else that will burn upon it, it presently consumes them to Ashes. The Water of itself is as cold as any Water I ever felt; and what is remarkable, as soon as ever the Fire is out, if you put your Hands into it, it feels as cold as if there had been no such thing as Fire near it. It still continues boyling up with a considerable Noise; and is visited by almost all that hear of it.

X. About 12 Years ago a Mineral Water was accidentally discovered in this City. In digging the Ground, they first met with a fat black Mold, extending itself 3 Foot deep, and gradually changing into another sort of Earth, very fat and like Butter. This second Layer was two Foot thick, the Colour yellow, something mixt; its Odour strong and Mineral; and a piece of it being sometime expos'd to the Sun, smelled much like burning Sulphur. After this they found a Quick Sand of a darker Colour than the first Earth, mixt with several little Stones, and the Smell still stronger than before. Two Foot further, under the Quicksand, a hard Rock appear'd, out of which Water gush'd with some Violence. They dug two Wells about 7 Feet distance from each other; one about eight or nine Feet deep from its Surface, and twelve from the Surface of the Ground about it, and reacheth the Rock: T'other is not so deep by two Foot, and only toucheth the Sand. This last is something stronger of the Sulphur, but the other is stronger of the Mineral Spirit and ferruginous parts.

Two Drams of the second Layer of Earth, found in digging, being put into four Ounces of Spirit of Vinegar, there presently arose a considerable Ebullition; and soon after the Spirit was ting'd with a yellow brownish Colour, which suffer'd no Alteration with the Infusion of Logwood, nor with Galls, but with Oyl of Tart. *p. deliq.* turn'd greenish, and with the Infusion of *Lig. neph.* of a pale red. The Water taken up at the Spring is extraordinary limpid, but grows something whitish in a quarter of an Hour, and in half an Hour the Spirit is lost and the Mineral hangs first on the sides of the Glass, and then falls gradually



to the bottom. It won't keep quite so well as the *Spaw* or *Tunbridge* Water. Its Taste is masculine and austere; the Smell ferruginous and strong, something upon the Sulphur: People say it smells like Gunpowder. It will make the Root of the Tongue of the Drinkers look blackish. Linnen wash'd in it turns yellow. It will not lather with Soap. The Glasses the Water is dipp'd with grow yellow, which no scowering can take off, and are apt to fly. In frosty and cold Weather, it is so warm as to melt Ice and Snow; in other Seasons it is cold, though not so cold as some Spring Waters are.

The weight of this Water varies much according to the Seasons and Weather. In *May* 1704, it weighed three Grains lighter than Common Water in the quantity of a Pound. In the Spring of 1705, it was equal in weight to common Water; and is now still heavier in *August* following, because of the exceeding dry Weather of that Summer. But in general about Midsummer, if the Weather is no ways extraordinary, it's pretty equal to common Water in weight. A single Grain weight of good Gall will turn a Pint and a half of this Water of a very noble deep red, and in an instant. Syrup of Violets turns it of a Grass green. With the Infusion of *Braile* it giveth a deep lively Blue: with that of *Lign. neph.* first a light Green, then a light yellow, with a blue Crown; with the Infusion of Logwood, a blue Black: with that of *Fustick* Wood, a dusky Yellow: with the Flowers of *Pomgranates*, a fair Violet: with Leaves of *Thea*, a fine purplish blue: with good *Nants* Brandy, an Elegant Sky-colour. It turns a Solution of the *Sacch. Saturn.* milky in an instant, and the Solution of Sublimate in some time longer. *Ol. tart. per deliq. sp. Sal. Armon. sp. Vit.* &c. make no sensible Alteration.

In calm Weather, in Winter especially, a thick oily Film covers the surface of these Waters, of as great a variety of Colours as a Rainbow; a Spoonful of it drunk, hath the effect of, and composeth as much to Sleep, as a moderate Dose of Opium. Some of this Scum, being dried by Evaporation, tasted very fat, and felt so between the Fingers. Some of this Powder being cast upon a red hot Iron, most of it immediately burn'd away with some sparkling; and what remain'd was of the Colour of rust of Iron, and tasted partly Stiptick and Earthy, and partly Saltish. The Water it self, being gently evaporated, yields a yellowish Sediment, more or less, according to the Seasons. Last Spring a Quart yielded six Grains of it; but in *September* following, the same Quantity afforded me nine Grains; whereas a Pound of *Tunbridge* Water gave but one single Grain of Sediment to *Mr. Boyle*, as appears by his *Memoirs of Mineral Waters*. This Sediment being boil'd in common Water, made a strong *Lixivium*, with which Acids caus'd no sensible Fermentation; but Syrup of Violets turned it Green. This *Lixivium* being evaporated, yielded a fat sulphurous Salt, that would not coagulate into Crystals. I can get but three or four Grains of it out of ten Grains of Sediment; but from the Colour and Taste of the *Lixivium*, I have reason to suspect,



suspect, that there is a larger proportion of Saline Particles, which as I conceive, being Volatile, evaporate away with the Water.

As for their Medicinal Virtues, I might say a great deal, but hoping to enlarge upon it another time, I shall only tell you, Sir, that from the many and truly wonderful Cures, I believe it to be one of the most excellent Waters of this kind, as yet found out in *England*. The little Well is very useful in Diseases of the Breast, as in *Asthma's*, Coughs, Rheums and Catarrhs. It hath cured several given over of Consumptions of the Lungs. Most Disorders of the Stomach are cured by this Water. It seldom fails in the Cure of Rheumatick gouty Pains of the Limbs, or other Parts of the Body, in the Scurvy and Melancholy Distempers, Jaundice, Vapours, all sorts of Stoppages, Scabs, Itch, &c. But in Gravel, Cholick, and Greenickness, 'tis a true Specifick, as also in inward Ulcers, if not too far gone. A Potter of *Bolton*, who had spent his Substance in Doctors, and was last Spring discharged out of *St. Thomas's* Hospital, as an Incurable Person, hath been cured of his Ulcer in the Bladder this Summer, with drinking of this Water for three Months together. In Agues it is beyond the Bark: I have seen some rebellious ones, that could not be removed by the Bark, perfectly cured by this Water, and some Constitutions quite worn out by the frequent Relapses of this Distemper, restored again. This is also remarkable, that it agrees best with old, decayed, and weak Constitutions. The Water sits pleasantly upon the Stomach, works off by Urine very briskly, causeth a good Appetite, cheers the Spirits, and procures Sleep. It is not binding, as some other Chalybeats are, but keeps the Body open to most People, and upon some it brings now and then a gentle Looseness, which carries off the Distemper. For these four Years I have prescrib'd 'em to many Scores of People every Season, and I could never observe any inconveniency, or ill Symptom arise from the drinking of 'em.

XI. Dr. *Jordis*, a Fellow of the *Royal Society*, with whom I kept a Correspondence for above thirty Years past, practised Physick at *Francford*, and often at *Smalbac* in Summer-time: I desired him to examine the Spaw Waters, and give me an account of the Contents of that *Sowr-Brunn* or *Acidula* (so much celebrated for its Virtues, and Concourse of Persons of the greatest Quality.) He gave me an account of some *Ocres*, or Ferrugineous Parts, which he calcin'd and tortur'd in the Fire, to make them confess their Sulphur Original; but in all his Experiments did not satisfy me that the Water held one Drop of an Acid by Distillation, &c. That which gave me the first Suspicion, that the *Chalybeat* Waters did not contain any rough, or Vitriolic, or Acid Salts in them, proceeded from an accidental Use of a strong Iron Water, in which I dissolved Soap, and found it lather and wash my Hands well, and then I us'd a Wash-ball and shav'd with it; and try'd several other Waters of this sort, which did the same, and much better than some Pump-Waters.

*An Examination of the Spaw-Waters, by Dr. Slare, n. 337. p. 247.*



I consulted my Palate, and try'd whether I could discover any Sharpness or Acidity in our *English* Steel-Waters at *Tunbridge*, at *Black Boy* in the Parish of *Franfield* in *Suffex*, *Hampsted*, *Sunning-hill* in *Berkshire*, &c. but I was so far from discovering any such Thing, that these Waters seem'd rather to leave a sweetish Flavour or Fare-well behind: Thus many Alkaly Salts, if nicely examined (of the fix'd kind) have affected my Taste.

I made Experiments with several sorts of such Spirits as are apt to ferment with Acids; such as Spirit of *Hart's-horn*, of *Sal Armoniac*, &c. but these made no Ferment, nor any Motion or Change in these Waters.

I consider'd the Diseases in human Bodies, which these Waters were prescrib'd, by Physicians, to cure; that they were often such as proceeded from sharp, acid, or acrimonious Causes, as *Cardialgia* or Heart-burnings, sower Vomitings, Corrosive *Diarrhæa*'s, Colicks from Scurvies and Stranguries; and that for these Distempers sweetning and Alkalifate Remedies are made use of.

I consider these Waters as containing in them the Properties of Iron; and I find by Experience, that it is most opposite to Acids, being one of their great Correctors, and therefore rather to be esteemed an Alkali.

1. Take some filings of Iron, perhaps a Dram, and pour on them about an Ounce of the milder Acids, such as Vinegar, Verjuice, or the Juice of Lemons, and it will destroy the Sharpness of these Juices: Or if you pour on these filings Mineral Acids, as the very corrosive Spirit of Nitre, or of Salt, or what is call'd Oil of Vitriol, they will immediately lose their Acidity, be disarm'd of their sharp Points, and by Evaporation give a Salt that will taste sweetish, and is by Chymists call'd *Saccharum Martis*, if duly prepared; which is safely given inwardly, and is esteem'd a good altering Medicine. 2. Steel beaten to a fine Powder is, without any farther Preparation, given inwardly with great Success for Stomachic Diseases, as in the Green-Sickness, *Hypochondriac* and various other Acid and Acrimonious Disaffections.

I consider'd Milk to be a very proper and obvious Subject to bring this Controversy to a plain and unquestionable Decision. I made this Experiment with all possible Exactness: I first prov'd the Chalybeat Waters, more particularly the Spaw-Waters, by trying whether they tinged with Galls. These being very good, I put part of the Waters to cold Milk; some I only made lukewarm, and some I boil'd together, in equal Proportions: But they were so far from affording any Curd or Coagulation, that they continued several Days without being sour.

Since Mineral Waters, especially those that are Chalybeat, are of such important use in Physick, and have gained amongst us so just a Reputation for their excellent Virtues, and are the greatest refuge in very potent and obstinate Diseases; this has made me judge it a work not unacceptable to Virtuoso's, especially those of the faculty of Physick, to have this Medicine fairly examined, its genuine Properties asserted, and



and what was called an Acid to be demonstrated an *Alkali*. Is it not a sort of Justice due to the World, that the *Germans*, who sent us over these Waters, with this false Character of Sowre Waters, should banish this misguiding Term from their *Spaw's*? It is from this Mistake, that their Physicians do prohibit the use of all manner of *Lactinia*, as if they were as noxious as deadly Poisons, whilst they are in a course of their Medicinal Waters.

Since this prejudice has prevail'd very much amongst most of our Water Drinkers in *England*, I do attest that I have frequently advis'd, in some Cases, Milk to be given daily in the Evening, through a whole Course of Steel-Waters, with good Effect: Nay, I do affirm, That some others could not bear the Waters without having a third part of Milk or more mix'd with them, and have continued them so for many Weeks with good advantage: Nor do I find the least reason to prohibit the use of Milk in a Course of *Bath Waters*, having been here above a Year and half, making the best Scrutiny I can into the Properties, Virtues, and Vices (if they have any) of these Waters: But of these Waters I may probably give some Account hereafter.

Since our Experiments discover, that those Things which are of a sweetening *Alkalifate* Nature, do so very well agree with these Mineral Waters, it will appear by the following Experiments that *Acids* do very much disagree. I put but one drop of Oil of Vitriol to a large Glass full of strong *Spaw-Waters*, which before the Addition of this *Acid* did give a deep purple to the Solution of Galls; but now would not give the least Tincture, though I put in four times as much of the Galls. From hence I conclude, that the Virtues of the *Chalybeat* Ingredients, which I take to be the Life and Soul of these Waters, were so far bound up or destroy'd as to have lost their Cordial or corroborating Faculty; and that the Bile or Gall in the humane Bowels could not be able to separate the *Chalybeat* (which are the only Medical) Particles, and mix them with the Chyle, in order to any End in Physick. Let this be a Caution to those that design to make these Waters pass better by Urine, that they do not make use of any *Acids*; it being a common Practice to use Spirit of Vitriol, *Spiritus Nitri dulcis*, &c. as a Diuretick: Unless it should so happen, that they have a design to take off, and divest them of their warm cordial or altering Power, and so to bring them near to common Water; which I must confess we are forced to do, especially in the use of *Bath Waters*, in some hot Inflammatory Cases.

I shall conclude with one short Experiment in favour of our *Alkalis*; that if you put any *Alkali* Salt, volatile or fix'd, such as Volatile Salt of Hartshorn, or of *Sal Armoniac*, or fix'd Salt of *Tartar*, of Wormwood, or any other true *Alkali*, you will then destroy the above-nam'd Acid Spirit, recover the virtue of the Waters, and dispose them to give their Tincture as they used to do in their natural State.

XII. Having procur'd about a dozen Quarts of *Pymont Waters* this last Summer, I made some Tryals with them. I found by the Taste <sup>Of the Pymont Waters, by the same,</sup> that <sup>n. 351 p. 564.</sup>



that they contain'd a rich Chalybeat Vertue, and also made a very brisk and lively Impression on the Palate, more grateful and spirituous, than the best *Spaw* Waters I ever tasted. The *Spaw* Waters are look'd upon as most excellent, if they sparkle a little in the Glafs: but these in Summer-time, when pour'd into the Glafs, nay sometimes even in the Bottle, as soon as the Cork was open'd and the Air was admitted, would make a notable Ebullition, somewhat like bottled Cyder, though this was soon over; but they did yet continue their smart and brisk Taste, and high Chalybeat Relish to the last Drop, though we were some Hours in drinking them off. In the Wintertime, these Waters do not Sparkle, nor Ferment, at least mine did not; but they were not carefully preserv'd, being expos'd in cold Cellers, where our Beer or Wine stood in the Winter; and yet notwithstanding, they lost not the Chalybeat Taste, and also retain'd a very pleasant brisk Gust. These Waters have been reckon'd in the Number of the *German Saur Brunnen* or *Acidulae*, and some of my Friends, to whom I gave a Glafs of the Water, have ascrib'd to it a sharp Taste, and have been ready to run away with a possess'd Opinion of its being Sour: but when I requir'd them to call back that hasty Assertion, and to consider it better, whether that Taste was really Sour or Acid, they have been forc'd to recant and confess, that the smart and brisk Taste mislead them to call it Acid or truly Sour. Thus Cyder and soft Ale when Bottled, will give such an acute Affection to the Palate, when it is far from being Sour: And even *Volatile Alkalies* of *Sal Armoniac* or of Hartshorn, may be made to give the like pungency to the Tongue.

In order to a more nice Enquiry, whether any Acidity were discoverable in these *Pymont* Waters, we dropt in considerable Quantities both of Spirit of Hartshorn, and of Spirit of *Sal Armoniac*, both justly prepar'd; but could not discover the least Luctation or Motion to appear upon this Conjunction, as it usually does with an Acid. I made a yet more nice and certain Examen of these Waters, by mixing Milk with them, sometimes in equal, sometimes in double Proportion; and in various degrees of Warmth, both in Lukewarm degrees, and also with a boyling Heat, but I could not perceive any Curdling. But rather on the contrary, the Water preserv'd the Milk from Coagulation, for four or five Days, even in *September*, it being hot Weather.

Take a very little Gall in Powder, about half a Grain to a Glafs of a quarter of a Pint; this does in a Moment render it turbid, and make a dark Purple, especially if you stir it: but if you drop the Powder on the Surface of the same Water, it then causes a fine blew Tincture. If you will make a very fine Tincture pleasant to the Spectator, Take five Leaves of strong Green Tea, put them into the bottom of a Glafs holding a quarter of a Pint, and you will see those Leaves unfold themselves, and in a quarter of an Hour, tinge the Water with such a cerulous azure Blue, that few Vegetables do afford the like. We observe, that the longer these Leaves, or any other Stipticks, (which are the Precipitators) do



do stay together, the more they degenerate into a deep Purple, or even to an Atramentarious Colour.

In reference to the internal Use of these Waters, I drank about a Quart at a time, after this manner. I first began with the *Spaw* Waters, which I procur'd very good, and drank them for a Week, and they agreed very well. I then drank the *Pymont* Waters for three or four Days, and continued the use of these Waters alternately, until I had drank about twenty Days. By the result of my Experiment it seem'd to me very plain, that the *Pymont* Water was more agreeable, gave more Strength and Spirit, and was as much or more preferable for its internal Vertue, as for its excelling the other in a brisker and more sprightly Taste.

There is another Excellency in these Waters which will make them more useful to us, than any Foreign *Chalybeat* Waters we yet know; because these will keep better, they are not so soon spoil'd by any accidental Insinuations of Air, as the *Spaw* are subject to be. The *Chalybeat* Mineral is here thoroughly dissolv'd and well united, and mix'd in this Water, so that it does not easily precipitate: for which Reason it may also the better pass the *vasa lactea*, and even enter into the Mass of Blood itself, and work the more considerable Effects. That this is not a bare Hypothesis may be prov'd by this Experiment.

Having suffer'd the *Spaw* Water to be expos'd in a Bottle which was half full, and unstopt 12 Hours, I examin'd it, and found it taste just like common Water; but the *Pymont* Waters that were opened to the Air after the same Manner, tasted strong of the Mineral, and gave their Tincture as at first; nay, they continued thus for full two Days, and perhaps might have done so longer, but I thought that Time suffic'd. I may fairly conclude, That since the *Spaw* has been very beneficial to our Patients in Chronical Diseases, these Waters of a much superior Virtue will surpass them in conquering many of our obstinate Distempers.

Having had lately some Discourse about a purging Quality contain'd in these Waters, I am now inquiring into the Truth of this Question, whether they in reality do contain any Purging Ingredients or Properties.

I evaporated about a Quart of this Water *ad siccitatem*; I then poured on the *reliquia* some Rain-Water, enough to dissolve and take up the Salts, and exhal'd that Water, and had a Grain or two of the Salts, that tasted *muratic*, such as most River and Pump Waters give. It is well known that the Purging Waters have a very bitter Taste, and by the learned Doctor *Grew* that Salt was called *Sal Catharticum amarum*; which distinguish'd it from all other Species of natural Salts: that of the *Pymont* Water above-mention'd has no Relation to this, but to the Sea-Salt, not being in the least bitter.



It is also well known, that unless our Waters be impregnated with a considerable Quantity of this bitter Salt, it will not purge at all: Two or three Grains signifie nothing, nor have the least Cathartic Power. For Example, Put two Drams of the purging Salts to a Quart of common Water; and this Quantity will give but a Stool or two to one who is naturally very easy to work upon. I have examined several other *Chalybeat* Waters, and found much the like Ingredients, and never any that I could suspect to carry any purging Properties.

I think we can much better demonstrate that the *Chalybeat* Waters do contain Stiptic and Restricting Virtues, because they owe their Birth to the *Iron Mineral*, and more particularly to the *Pyrites*, which Doctor *Lister* suggests, (not without some Reason) to be the Parent even of all *Iron Oars*, as it is doubtless the Cause of all *Chalybeat* Waters: Thus I have often examined the Solution of the *Pyrites* by the Rain Water at *Debtford*, and at other Places where *Copperas* is made, and found it a very strong *Chalybeat* Water. It is from this *Mineral* we have our strong Stiptic and constringent Medicines, for external and internal use; we have our Powders and Salts of *Steel*, or *Vitriol* of *Mars*, from hence; nay, even those obstinate and inveterate *Diarrhaas* which have baffled the Force of all Medicines, have, by a judicious Use of *Tunbridge* and other *Iron Waters*, received a Cure.

But notwithstanding all we can say, it will be retorted, that there is Matter of Fact and Experience against us, that the Waters really do purge at *Pymont*, where they are drank. This we do allow to be true, that *Tunbridge* Waters do not only purge but sometimes vomit, when drank hastily and in great Quantity; but our Physicians have corrected this Irregularity, and we hear of no such Complaints, where they observe a just *Regimen*. And we do all agree, that those Waters are in their own Nature binding, and do oft require some opening Medicine. The Quantities of Water drank at *Pymont* are very large, often two or three *English* Quarts. It is no Wonder that their Weight forces them thorow the Bowels; for any common Water drank hastily, and in such Quantity, will do the same. Whereas, if you take this Method, and will drink *Pymont*, or any other *Chalybeat* Waters leisurely, viz. a Pint Glass in an Hour, or rather two half Pint Glasses, you may drink three Pints in so many Hours without Danger of losing them by Dejection. But if any one will be careful, and take this Caution with him, he will scarce fail of Success: that is, let him be very quiet and still, both in Body and Mind; the less he stirs or walks, the better he will pass off his Waters by Urine. And though this will appear a Paradox, especially to those Physicians who practise abroad, and commend to their Patients much Action in walking, yet I know I have both Reason and Experience on my Side. To avoid Prolixity, I shall not declare them at this Time, and shall only ask leave to mention one Observation I have made, that none of our *English* Steel Waters do strike such a Purple as the Foreign celebrated *Chalybeat* Waters do: for ours do



give a more turbid and dark Colour, and the worſe the Waters are, the blacker Sediment they make: Thoſe of *Iſlington* abound with a coarſe *Oker*, the Mineral is not well diſſolv'd, but gives an *atramentarious* Colour; but the *Pymont* Waters excell all I have happened to examine, in its bright *Cæruleous* Luſtre.

N. B. *Moſt of the Experiments alledg'd by Dr. Slare, in the foregoing A Note by ... Diſcourſe, were likewise by him ſhewn before the Royal Society, Feb. 28. 1717.* <sup>ib. p. 569.</sup> and it was found that the *Pymont Waters* gave a much more exalted *Chalybeat* Taſte than the *Spaw*; and a ſmall Quantity of each being kept for ſome time in Bottles, to compare them, the *Pymont* was found to have retained its *Virtues* much better than the *Spaw*. The *President*, and ſeveral of the *Members* preſent, having drunk a Glaſs of it, found it of a very agreeable Reliſh, and to ſit eaſy on the *Stomach*.

X. *Vetterus* a *Septentione Meridiem* uſque vergens, de *Askerſun-* <sup>Of the Lake</sup>  
*dio Nericiæ* ad *Jonekopiam Smolandia* 14. *Suecica* metitur *milliaria*, <sup>Vetter in</sup>  
 quorum quodlibet 5 vel 6 *milliaria Anglica*, & decem unum fere con- <sup>Sweden, by</sup>  
 ficiunt gradum. *Latitudine* vero 3, nonnunquam vix 2. ſuperans *Mil-* <sup>Dr. Urban</sup>  
*liaria*, *Gothiam* in duas dividit partes, quarum quæ ad orientem ſita, <sup>Hearn, n. 298.</sup>  
*Oſtrogothia*, & ad Occidentem *Veſtrogothia* communiter nuncupatur. <sup>p. 193<sup>8</sup>.</sup>  
 Illius ad ripam cum arce & Civitate *Wadſtenenſi* celebris cernitur mons  
*Abme* vel *Ohme*, ad hujus vero vetus illud *Veſtrogothia* oppidum  
*Hio*. Lacus autem ipſe, ob elevatiores montium colles, qui hunc in ipſo  
 litore ſæpius ambiunt, nonnunquam paulo remotiores prominent, ad-  
 ſtantibus ſemper apparet ad latera depreſſus. Profunditate gaudet in-  
 ſigni, adeo vero inæquali, ut aliquibus in locis ad 80, in confiniis vero  
*Oſtrogothia* diverſis, paucisq; *Veſtrogothia*, ad trecentas uſq; orgyas nullum  
 reperitur fundum. Confirmat hoc ſingulare quoddam experimentum,  
 cujus me participem non ita pridem fecit Magiſter *Ericus Simonius* Pa-  
 ſtor & Præpoſitus *Vadſtenenſis*, extitiſſe videlicet civem quendam *Vad-*  
*ſtenenſem* *Benedictum Amberni*, qui ut ad litora civitatis *Greñnenſis*  
*Vetteri* exploraret profunditatem, aliquot centum Orgyarum funes,  
 ſecuri loco ponderis appenſa, demiferat, fundo autem nuſquam re-  
 perto, cum funes iterum collegerat, ſecuri deperdita, cranium equi  
 chordæ exacte alligatum obtinuit. Similis item abyſſus ad præcipitia  
 montis *Ohmenſis*, quæ *parietis occidentalis* nomine inſigniuntur, ri-  
 mantium ſcrutinia ſemper illuſit, ut ea propter non facile quiſquam his  
 adpropinquare audeat metu *Zephyri*, qui ſubito increſcens, anchoris  
 nequidquam juvantibus quamvis undiq; jaſtis, ad declivia montium  
 navigia facile protrudit. Pariter ad *Veſtrogothia* quandam plagam al-  
 titudinem aquarum metiri cupiens olim Gubernator Comes *Johannes Ox-*  
*enſtierna*, projectis 300 orgyarum funibus nullum offendit fundum,  
 prout hoc teſtantur piſcatores adhuc in vivis, quibus hoc negotii  
 illo tempore committebatur. Limpida non minus quam profunda  
 aquarum hæc eſt congeries, ut ad diſtantiam inſignem parvulus in  
 fundo cernatur nummus. Ipſe Magiſter *Ericus Simonius* album vel  
 denarium 60 immerſum cubitis aere ſereniore ſe fatetur obſer-  
 vaſſe.



vasse. A superficie autem remotior aqua aliqua quasi viriditate tincta videtur: Et mirum sane tot sese in hanc exonerantes paludum, montium, sylvarumq; fordes, limpidam hanc aquam ne leviter quidem inficere.

Amplitudine licet multos noster superet lacus, ut plurimum tamen a scopulis immunis paucissimis gaudet insulis. Quarum præcipua Comitum *Brachæorum* antehac sedes *Visingæ* dicta, in medio aquarum *Grennam Smolandicæ & Westrogothiam* interjacet, prout ad boream insula *Rokenensis* Acidulis *Medeviensibus* e regione est opposita. Apparent & aliæ ad litora sitæ insulæ, paucissimæ tamen aquæ ac parvæ. Cum vero ventis sic libere expositus, proceris undique cingatur *Vetterus* montibus, nil mirum raro eundem quiescere, sed procellis sæpius agitatam, altioribus arctisque fluctibus navigantium cymbas vehementer concutere; Idq; adeo sæpe inopinato, ut aquis instar speculi quietis teste commoveri incipiat, antequam vel minima aeris ventilatio sentiat. Quod efficere videtur tempestas, sub aquis aliunde oriunda, sensim eundem protrudens, priusquam ventorum turbines eousq; potuere derivari. Haud enim in *Vettero* infrequens furentibus ventis ferri navigia in uno loco, cum aliæ in confiniis ob tranquillitatem aeris remis propelli cernuntur. Indicio minime frustraneo a ventis subterraneis irruptiones ejusmodi aquarum abunde promoveri eodem plane modo, atq; similes effectus explicare conatur *Varenius* in *Geograph. Univer.* Confirmant has suspiciones Phænomena diversa. Imminente enim Tempestate imbribusq; ululatus vel tonitru aquarum aere adhuc sereno percipiuntur, quod mihi ipsi ad *Medevienses* Acidulas, aura etiamnum placidissima, non raro audire contigit, subsequente semper turbine procelloso. Manifestius adhuc hoc experiantur incolæ *Visingoenses*, quibus ab illo tractu insulæ, unde die posteriori venti oriuntur, instar ictuum tormentorum aures confuse vellicantur. Cumq; ad orientem ejusmodi rugitus deprehenduntur, ut plurimum cum grandine & pluviis excitari solet *Eurus*. Consideratione etiam dignæ variæ illæ sunt sufflationes, vadorum subitanæ elevationes, & confestim profilientes halitus, quos in hoc lacu nonnulli observavere. Non absque admiratione tale quid cum fociis animadvertit Architectus *Abraham Winandz*, qui has oras aliquando præteriens, aquis tum maxime quiescentibus, strictim hinc inde instar telorum e fundo ejaculari nubeculas conspexit, qui deinceps fumi in aere sese jungentes, levibus pluviis toto die peregrinantes infestant, quæ omnia ventorum subterraneorum præsentiam non incerte arguunt.

Idem proculdubio ventus, cum superius adveniente procella, in causa est; quod cum tempore verno glacies adhuc valida & spissa hac hora equis trahisq; sustinendis abunde sufficiat; altera, glacie evanescente ejusdem ruptum per totum lacum repente adeo contingat, ut qui paulo ante equis secure vehebatur, jam aqua undiq; patente ibidem placide queat navigare. Antequam vero ejusmodi metuenda irruptio, stupendus qui præcedit aquarum rugitus viatoribus fugam cum terrore suadet, qui tamen a litore aliquando remotiores, vel aquis extemplo immerguntur, vel super glaciei fragmenta morti vicini aliquandiu vagari coguntur. Nunquam abrupte fundum petit glacies aere vel minime commoto.



Num vero subterraneis ejusmodi ventis excitandis metallici inferviant halitus, hac vice in medio relinquo. Eos vero illic loci neutiquam deficere evincunt varii ad *Vetteri* boreales *Nericiæ Westrogothiæq;* plagas fiti montes, venis martialibus, fortasse & metallicis nobilioribus nuperius detectis, aliisq; mineralium speciebus diversis, Antimonio videlicet, Magnesia, Calce, Mica sterili nitido, Galenæ speciebus, Ochra Pyrite-que opulenter referti, unde Sulphur, Vitriolum, Alumen aliq; succi minerales elici alioqui consuevere. Quin in ipsis pariter aquis, non minor Pyritidis quantitas quam Ochra cujusdam ferruginosæ copiosa reperitur congeries, cujus frustula curiositatis ergo non raro ipsemet collegi. Huc ignis referendus est fatuus, non ad litora solum frequenter observatus, sed tempore nocturno in mediis aquis volitare & piscatores confundere visus. Quem crescentibus metallicis sulphureisq; deberi halitibus plurimis est persuasum. Nec sine Vaporum mineralium ope Granati, Porphyrii, Jaspides, Chyalli, selectique alii generantur in hoc lacu lapides, qui a beato Comite *Petro Braheo* olim collecti, & ad tantum redacti fuere nitorem, ut inter ornamenta Sponsarum etiamnum *Visingsburgi* adhibeantur. Quæ omnia metallicam agnoscunt profapiam, ut *Vettero* propinquas *Medevienses* taceam Acidulas, quarum descriptionem proxime animus est exhibere.

Inter reliquas nostri lacus proprietates admirationem sane non effugiunt insignes sub aquis vortices, torrentesq; pertinaces, qui in hoc unico licet gaudentes ostio ventis fluctibusq; directe obversi piscatoribus non leve faceffunt negotium. Suspicio hinc enata ob profunditatem inexhaustam, clam ruentes alveos ventosq; sub terra genitos aliquam huic *Vettero* cum alio ab hoc ad occidentem X miliaribus *Suecicis* distante *Vennero* sub tellure esse communicationem. Nec aliter suadent diversæ voragines hos lacus interjacentes, quarum duas paræciæ *Fægrensis* voraginum albæ & nigræ nomine insignitas, metiri curavit Dominus *Haddorpius* celebris in *Suecia* Antiquarius, altitudines vero deprehendit immensas, motumq; in his observavit intestinum, ac si fermento turgidæ extitissent. Eidem opinioni fovet, quod absq; causa manifesta certis annis augeatur nostra aqua, cum sequentibus notabiliter iterum decrescat. Animadvertit Pastor *Motalensis* Dominus *Daniel Kydelius* præteritis hisce septem Annis, certis quibusdam in locis sensim adeo evanuisse *Vetterum*, ut ad aliquot orgyas sicco pede illuc ambulare potuerit, quo cymbis antea vehi cogebatur, pluvia interea temporis, annis videlicet 1680, 1682, 1684 & 1685, undiq; abundantes. Anno vero 1686 versus autumnum aqua paulatim iterum cernebatur augeri ad hunc usq; annum 1688. An vero statuta sic servet tempora noster lacus, ac *Vennorum* singulis septem annis accrescere septemq; vicissim diminui ejus rimatores contendunt, de hoc certi quid determinare nequeo. Admiratione itidem est dignum, ære sereno tormentorum ibidem sentiri explosiones, *Holmiæ* aliisq; in locis ad 30 miliaria distantibus institutas. Ut cum Anno 1685. Regii Principes *Holmiæ* sepelirentur hora quinta quilibet ictus exacte perciperetur. Pari facilitate tela Anno 1676 in pugna na-



vali explosa ad 30 circiter milliaria distincte fuere observata. Constat reperiri adhuc cavernam & quidem fœtore refertam sulphureo & nauseabundo, quem, assentientibus accolis, ipsi speluncæ prope aquas in palude sitæ & collecto per longius tempus squalori, sulphureos, uvidosq; exhalanti Vapores, potius adscribendum censeo, quam causis quibusvis vulgo allegari solitis. Adparere etiam in confiniis diversa spectra & phantasmata, quæ ut plurimum fœminarum, aliquando equorum vel alius animalis ludicra specie sese sistunt, nemo hisce curiositatibus intentus inficiabitur.

Nec silentio præteriri debet celebris iste amnis *Motala*, qui, unicum uti dictum *Vetteri* nostri ostium, certis temporibus fluiditatem quasi deponere, & in decursu adeo solet sisti, ut libere hunc ingredi, piscesq; in fundo relictos absq; impedimento capere nonnunquam fuerit concessum. Prout Anno 1682 & 1685 tempore *Natalitiorum Christi* idem evenisse constat. Utut varie hanc rem explicare conentur huic amni vicini, illo instanti aquas a litoribus recedentes fundum petere rati; semper tamen suspicio mihi oborta fuit, vel glacie vel nive fluminis infima obstructa munimentum aquis præbuisse inferioribus interea sese in Mare exonerantibus. Ansam huic opinioni dedit, 1. Quod nunquam vere, æstâte vel autumno, sed semper tempore *Natalitiorum Christi* vel novi Anni isthæc contigerit mutatio. 2. Quod prope pontem semper contigerit, ubi aquis ultra tres ulnas minime profundis, aggerum lapidumque acervi quibus Pons innititur, fluminis decursum refrænant. Hanc suspicionem veritati consonam testatur propria & aliorum experientia suffultus Pastor Ecclesiæ *Motalensis* in limine pontis habitans, qui herbas longiores, ut *Potamogetan*, *Polygonum aquaticum*, &c. a ponte ad propinquos anfractus in aquis germinare asseruit, & his glaciem striarum instar & nivis congelatæ adhærere, quæ a flumine detrusa & in pontis fundamenta delata tractu temporis cumulari & toto amni sistendo sufficere potest. Fatentur pariter molitores ibidem habitantes, imminente fluxus cohibitione, niveas quasi moles e lacu derivari, quæ corpori, cui impingunt, instar glutinis adhærentes, fundum sensim petunt. Nec infrequens aquas per totum lacum uno die æqualiter quiescas, altero irritatas prope pontem sisti. Quidquid vero sit mirationem adhuc subit, non hyeme intensissimo, sed aere clementiore, & quidem ut plurimum circa ferias Natalitias, & novi anni retardationem contingere. Frigus forte sub aquis adhuc viget, licet in aere cessaverit, vel glacies debilius congelata herbis aliisq; impedimentis detenta, obstructions hæc parit.

De fonte quodam non longe a *Vetteri* litore in paræcia *Nyensi* (ubi & *Acidulæ Medevienses*) prope Templum & Pastoris ædes sito, quæ ex ingenua parochi dignissimi D. *Jonæ Frodelii* aliorumq; relationibus haurire licuit pauca dicam. Esurinum hunc fontem vel annonæ appellitant vatem; eo quod nunquam aqua sufficienter repleatur, nisi annonæ succedat sequente Anno caritas. Ambiunt hunc fontem undiq; colles arenosi molliores. Interjacet hos vallis depressa, sed minime paludosa. Ex hac occultis meatibus hæc Scaturigo promanat, in eo singulare quid obtinet, quod Æstâte pluviis abundante ut plurimum evadat aridus, cum

vicissim



vicissim æstatibus siccissimis, instante fame, ut & secundum alios (quos attingere non vacat) bello, Regiam *Motalensem Vadstenensemq;* viam inundet, prout multorum ibi habitantium evincunt testimonia. Anno 1685 pluviis & imbribus frequentissimo, penitus hic fons exaruit, nec ultra dimidium pedem squalida. Anni 1686 æstate aqua accrescere visa est. Nec veritatem hujus narrationis in dubium revocare præsentis anni permittit siccissima æstas, quacum aquis penitus vacui evaserunt fontes vicini omnes, hic aqua quam maxime abundavit. Sequentia hac in parte attendentes momenta, faciliore negotio forte re enucleabimus.

1. Soli *Ostrogothiæ* ex locis fonti proximioribus annonæ denunciari caritatem.

2. In tota hac Regione fontisq; præcipue vicinia arenosum esse campum; parte etiam aliqua limo duriore gaudente, quibus imprægnandis sufficiens semper requiritur lympha; proinde etiam

3. Deficere ibidem segetes non nisi in siccioribus annis, cum contrarium obtineat *Iemptia*, aliæq; provinciæ nonnullæ septentrionales.

4. Meteorum tempestatisq; proventus, terræ & quidem sub superficie latentis aliquando sequi indolem.

5. Prope colles arenosos venis non patentibus per sabulum quasi colatura trajectas colligi aquas hujus scaturiginis.

6. Physicas ob causas imminente tempestate sicciore, augeri vel abscedere posse eas aquas, pluviosa iterum decidere, quæ prolixius deducere alterius erit temporis & instituti.

XI. I can affirm there is no petrifying Quality in that Water. I liv'd 14 Years in *Dungannon*, within five Miles of it, and was very often there, about the Skirts; for many Miles, and in a Boat upon it several times. I have taken the Survey of a great part of the Shore thereof, at such a time as the Waters were very low, and a large Strand left in several Places: And many Trees lay in the Verge of the *Lough*, which I believe might some of them have lain there some hundreds of Years, which had been overturn'd by the *Lough's* encroaching on the Land, where great Woods had grown; and many Roots of great Trees were standing in their proper Places, where the Water had prevail'd on the Land, and no Alteration in the Wood at all, but it was firm, sound Wood, without any Petrification. And Mr. *Brownlow*, whose Estate in *Ardmagh* lies contiguous to the *Lough*, told me, That he did believe that there was not any petrifying Quality in the Water; for that he had made several Tryals, and had order'd Holly Stakes to be driven into the Ground within the Verge of the *Lough*, and that some of them continued there many Years, but that he found no Alteration.

Yet notwithstanding all this, there has been great quantities of such sort of Stone, like unto Wood, found upon the Strand after great Floods and Storms of Wind, which have put the *Lough* into a Ferment; the Waves breaking down the Banks, incroaching on the Land, and tumbling over Trees, by which Incroachment this sort of Stones are discover'd: And



if ever they were Wood, they were petrify'd by the Earth, and not by the Water; of which kind I have seen several Pieces big and little, some like Oak, some Ash, and some like Holly, with Bark, Grain and Knots like Wood; so that any by the Eye would judge it Wood, till they come to try it. I had a Piece about sixteen Inches long, that look'd as if it had been a great Chip cut out of the side of an Oak-block, with the Bark on it; and in cutting such Chips, there happens generally some Shakes or Flaws in such large Chips, so that there will be a Separation of Parts at one end, and they remain firm at the other, as it was in this. I could have rais'd several such Splinters of this large Chip, some bigger and some less; and when rais'd, they would have flap'd down as though they were a Spring. Some of those Stones would appear at one end as if rotten, and decayed Wood; but trying it, it was as much Stone, as any other part.

Now as to the Lake itself, it is reputed to be twenty four Miles long, and twelve Miles broad, and Navigable from *Charlemount* to *Portlenoue*, which is about thirty five Miles. It does not abound with many sorts of Fish, but those that are are very good, such as Salmon, Trout, Pike, Breame, Roch, Eels and Pollans, with which last it does abound: The *English* call them fresh water Herrings, for want of another Name; for Pollan is an *Irish* Name. They catch them in the Summer with Sieves, as they do Herrings, and they are a great Relief to the Poor, being very cheap: They are much in shape and bigness like to the largest Smelts, full of very large bright Scales, and pleasant Meat, being eat fresh. These were supposed to be a peculiar Fish to that Lake; but since I came here, I find *Lough Earne* has the same sort, but not in so great Plenty. They are generally caught here in their Eel-Nets, running to the Sea; so that I am of Opinion, that they are that sort of Fish which is caught in the Sea, or between the fresh and Salt-water, called Shads; and that the large ones come from the Sea, as the Salmon doth, and leave their Spawn in the *Lough*; which, when they grow to be big, go to the Sea, and there come to their full Growth: And that which confirms me in my Opinion is, that at the Salmon-fishing at *Colraine*, they catch many of the large ones going up to the *Lough*. There is one sort of Trout in *Lough Neagh* very large: I have seen one weigh thirty Pound weight; and the largest Salmon that I ever saw weigh'd not more than thirty five. This sort of Trout the *Irish* call a *Budagh*. That there is some healing quality in the Water of this *Lough*, is certain; but whether diffus'd through all Parts thereof is not known, nor pretended. There is a certain Bay in it, called the *Fishing-Bay*, which is about half a Mile broad: It is bounded by the School-lands of *Dungannon*, hath a fine Sandy Bottom, not a Pebble in it, so that one may walk with safety and ease from the Depth of his Ankle to his Chin, upon an easy Declivity, at least three hundred Yards before a Man shall come to that Depth. I have been in it several times; and I have always observ'd, that as I have walk'd, the Bottom has chang'd from



from Cold to Warm, and from Warm to Cold, and this in different Spots through the Bay. Several have made the same Observation.

The first Occasion of taking Notice of this Bay for Cure, happened to be no longer ago than in the Reign of King *Charles* the Second, and was thus. There was one Mr. *Cunningham*, that lived within a few Miles of the Place, who had an only Son grown to Man's Estate. This young Man had the Evil to that Degree, that it run upon him in eight or ten Places: He had been touch'd by the King, and all Means imaginable us'd for his Recovery; but all did no good, and his Body was so wasted, that he could not walk. When all Hopes of his Recovery were passed, he was carried to the *Lough*, where he was washed and bathed; and in eight Days time, bathing each Day, all the Sores were dry'd up, and he became cured, and grew very healthy, married, begot Children, and liv'd nine or ten Years after. After so remarkable a Cure, many came there, who had running Sores upon them, and were cured after a little time. Great Crowds come there of all sorts of Sick; and sick Cattle are brought there likewise and driven into the Water for their Cure; and People do believe they receive Benefit. I know it dries up running Sores, and cures the Rheumatism, but not with once bathing, as People now use it; and the drinking the Water I am told will stop the Flux. I look upon it to be one of the pleasantest Bathing Places I ever saw.

## XII. Accounts of Books Omitted.

1. Aloyfii Ferdinandi Comit. Marfigli Danubialis operis Prodrumus. n. 276. p. 1038. Ad Regiam Societatem Anglicanam. Fol. 1700.

2. Dr. *Ehm's* Treatise of St. George's Bath, by *Landeck*, in the Lordship of *Glatz* near *Silesia*. n. 308 p. 2345.

## C H A P. III.

### Mineralogy.

I Discover'd lately in the Mountains a Marble Quarry; the Country wherein it lies is so strange for the natural Wonders in it, that it would make a little History to describe all that is to be seen. It lies on the Northside of *Calcagh*, in the Parish of *Calasher*, and County of *Fermanagh*. There are Marble Rocks, whose perpendicular height is 50 or 60 Feet discover'd by subterraneous Rivers, which by degrees, have wash'd away the Earth and loose Stones, and discover'd these mighty Rocks. There are a great many Pits fallen in on the sides of the great Mountains; several of them in a small Compass of Ground, so that 'tis dangerous

I.  
A Quarry of  
Marble in Ire-  
land, by Fra.  
Nevil, Esq;  
n. 337. p. 278.



dangerous travelling near them. There are many Caves form'd, some very large, the Sides and Arches of Marble: some of a Liver Colour, varied with white in many little Figures; some of a light blue, varied with white; but I could find no entire black or white among them.

Marble, &c.  
in Wales, by  
Mr. Ihwyd,  
n. 337. p. 275

II. We have lately discover'd a new sort of Marble in *Merionydshire*, which when polish'd, represents a number of small Oranges cut a cross, the reason whereof is an infinite Quantity of *Porus* or *Alcyonium* stuck through the Stone. *Pembrokeshire* and *Caermarthenshire* afford great quantity of Allum, and *Merionydshire* of Copperas; at the latter I saw a great Vein of Pyrites strongly impregnated.

An Eruption of  
Mount Vesu-  
vius in 1707.  
by Sign. Jos.  
Valletta  
n. 337. p. 22.

III. *Anno* MDCCVII, cum jam æstas ingravesceret, in extremis mensis Julii diebus *Vesuvianus* mons, qui diu quieverat, aliqua motus signa edere incepit, nam interni mugitus primo auditi sunt, qui in ipso montis umbilico personabant, nullo tamen adhuc dato aut fumi aut flammæ indicio. Deinde paulatim post editos sonitus fumum emittere & clarum ignem incepit, qui noctu præsertim toti Campaniæ illucescebat. Per varia interim intervalla bombos dedit adeo horrifonos, ut vix ipsis comparandi sint crepitus e majoribus nostri temporis tormentis bellicis elicti: Inde cineres veluti ex materia jam pinsata interius volvere perseveravit, per plures dies noctesque eos undequaque volvens in cælum elatos, & in varias regiones dispersos, sicuti ventus spirabat diversus, modo in subjecta maria, modo in Stabianos, modo in Nolanos, & Acerranos agros eos ejiciens. Nec silentio prætereunda vehemens lapidum pluvia, quæ cum hominibus, tum jumentis exitio fuit. Post hæc liquidum bituminis flumen, quod glaream vocant, e patulo ore, uti alias, vomere incepit, quod ignitam primo torrentis placidi formam habebat, ea motus lenta celeritate se deorsum moventem, quam in pice liquefacta aut densioribus aliis observamus. Hæc materies, quam vitro ex arena liquefacto compararem in ferventissimis fornacibus, item ac vitrum ubi procedens deferbuerat, lapideam duritiem acquirebat. Illud autem observatu dignum putavimus, quod superior hujus materiei deservescens superficies in lapides minutos spongiosos se vertebat, inferior vero in solidum latissimum & durissimum silicem, quo in sternendis viis ab antiquo utimur; quasi quæ proxima aeri erat illius particulas retineret immistas, inferiore parte nullo inani admisto in compactissimam massam coacta. Cæterum inter plurima montis effervescentis Phænomena duo certe fuere a multatate non visa, & ignota: tertio namque die aut quarto, fulgetra emitte ex orificio cepit, ejusdem fere aspectus ac quæ e Cælo interdum micare videmus, sed tortuosa & serpentina, & in eorum emissionem tonitruorum bombi audiebantur, ut Cælo tonante eadem timemus: fuere ea tam spissa & frequentia, ut primo quidem putaremus pluviam casuram, usquequo animadversum est ea ex monte prodire, & obscuras nubes non ex vaporum materia, sed densitate cineris cadentis compactas. Interea IV. Nonas Augusti, quarta post meridiem hora, tanta ingruerat cineris densitas



densitas aerem Neapoli imminentem, ut exclusis radiis solaribus tenebræ undique sint inductæ, & quidem ea obscuritate, ut commeantes per urbem in ipsis compitis socios amicosque agnoscere non potuerimus. Nulla nox illo die nigrior; accensis facibus si quis domo prodierat redire cogebatur, quod solum temporibus Titi accidisse ex Xiphilino accepimus. Tandem circa primam aut alteram noctis horam, ex Septentrionali parte, quam minor fortasse occuparat cinerum vis, unum aut alterum sidus micare visum est, & cærulea facies Celi apparere, & inde sensim per noctem tenebræ minui visæ sunt, quæ diem prius oculis abstulerant. Tum divino beneficio, ea cinerum materies averso vento e nostra regione ad mare subjectum perlata est. Dies ortus non jam adeo illustris, sed reliquiis etiam cinerum per aerem interspersis, semiclarus, & retinebat *dubiæ discrimina Lucis*.

Neapolitani demum metu levati, ut Divo *Januario*, præsentis eis semper in angustiis memoriam perpetuam statuerent, eidem numisma cudi curaverunt ex auro argentoq; ubi Divi Januarii caput cum hac epigraphe. *Divo Januario Liberatori Urbis & Fundatori Quietis*; & altera numismatis facie pacatus Vesuvius cum epigraphe: *Postquam collapsi cineres & Flamma quievit. Cives Neap. incolumes. A. MDCCVII.*

IV. *April 17. 1717.* I reach'd the top of Mount *Vesuvius*, in which I saw a vast Aperture full of Smoak, which hindred my seeing its Depth and Figure. I heard certain odd Sounds within, which seem'd to proceed from the Belly of the Mountain; a sort of Murmuring, Sighing, Throbbing, Churning, Dashing (as it were) of Waves, and between whiles a Noise like that of Thunder or Cannon, which was constantly attended with a Clattering, like that of Tyles falling from the tops of Houses in the Streets. Sometimes as the Wind chang'd, the Smoke grew thinner, discovering a very ruddy Flame, and the Jaws of the Pan or Crater streak'd with Red, and several Shades of yellow. After an Hours stay the Smoke being mov'd by the Wind, gave us short and partial Prospects of the great Hollow, in the flat Bottom of which I could discern two Furnaces almost contiguous; that on the left seeming almost three Yards in Diameter, glow'd with red Flames, and threw up red hot Stones with a hideous Noise, which as they fell back, caus'd the fore-mention'd Chattering. *May 8.* in the Morning, I ascended to the top of *Vesuvius* a second time, and found a different Face of things; the Smoke ascending upright, gave a full Prospect of the Crater, which as I could judge, is about a Mile in Circumference, and an hundred Yards deep. A conical Mount had been formed since my last Visit, in the middle of the Bottom. This Mount I could see was made of the Stones thrown up and fallen back again into the Crater. In this new Hill remained the two Mouths or Furnaces already mention'd; that on our left Hand was in the *Vertex* of the Hill which it had formed round it, and raged more violently than before, throwing up every three or four Minutes,



nutes, with a dreadful Bellowing, a vast Number of red-hot Stones, sometimes in appearance above a Thousand, and at least 300 Foot higher than my Head as I stood upon the Brink. But there being little or no Wind, they fell back perpendicularly into the *Crater*, increasing the conical Hill. The other Mouth to the Right was lower in the side of the same new formed Hill. I cou'd discern it to be fill'd with red hot liquid Matter, like that in the Furnace of a Glass-House, which raged and wrought as the Waves of the Sea, causing a short abrupt Noise like what may be imagin'd to proceed from a Sea of Quicksilver dashing among uneven Rocks. This Stuff wou'd sometimes spew over and run down the convex side of the conical Hill, and appearing at first red hot, it changed Colour, and harden'd as it cool'd, shewing the first Rudiments of an Eruption, or if I may so say, an Eruption in Miniature. Had the Wind driven in our Faces, we had been in no small Danger of stifling by the sulphurous Smoak, or being knock'd on the Head by Lumps of molten Minerals, which we saw had sometimes fallen on the Brink of the *Crater*, upon those Shots from the Gulf at Bottom. But as the Wind was favourable, I had an opportunity to survey this odd Scene for above an Hour and a half together; during which it was very observable, that all the Volleys of Smoak, Flame, and burning Stones, came only out of the Hole to our Left, while the liquid Stuff in the other Mouth wrought and overflow'd as hath been already describ'd.

June 5. After a horrid Noise, the Mountain was seen at *Naples* to spew a little out of the *Crater*. The same continu'd the 6th. The 7th, nothing was observ'd till within two Hours of Night, when it began a hideous bellowing, which continued all that Night and the next Day till Noon, causing the Windows, and as some affirm, the very Houses in *Naples* to shake. From that time it spew'd vast Quantities of molten Stuff to the South, which stream'd down the side of the Mountain, like a great Pot boiling over. This Evening I return'd from a Voyage thro' *Apulia* and was surprized, passing by the North-side of the Mountain, to see a great Quantity of ruddy Smoak lie along a huge Tract of Sky over the River of molten Stuff, which was it self out of sight. The 9th, *Vesuvius* raged less violently; that Night we saw from *Naples* a Column of Fire shoot between whiles out of its Summit. The 10th, when we thought all would have been over, the Mountain grew very outrageous again, roaring and groaning most dreadfully. You cannot form a juster Idea of this Noise in the most violent Fits of it, than by imagining a mix'd Sound made up of the raging of a Tempest, the Murmur of a troubled Sea, and the Roaring of Thunder and Artillery, confused all together. It was very terrible as we heard it in the further End of *Naples*, at the Distance of above twelve Miles. This moved my Curiosity to approach the Mountain. Three or four of us got into a Boat, and were set ashore at *Torre del Greco*, a Town situate at the Foot of *Vesuvius* to the South-West, whence we rode four or five Miles before we came to the burning River, which was about Mid-night. The Roaring of the



*Volcano* grew exceeding loud and horrible as we approach'd. I observ'd a Mixture of Colours in the Cloud over the *Crater*, green, yellow, red and blue; there was likewise a ruddy dismal Light in the Air over that Tract of Land where the burning River flowed; Ashes continually shower'd on us all the way from the Sea-Coast. All which Circumstances set off and augmented by the Horror and Silence of the Night, made a Scene the most uncommon and astonishing I ever saw; which grew still more extraordinary as we came nearer the Stream. Imagine a vast Torrent of liquid Fire rolling from the top down the Side of the Mountain, and with irresistible Fury bearing down and consuming Vines, Olives, Fig-trees, Houses, in a Word, every thing that stood in its way. This mighty Flood divided into different Channels, according to the Inequalities of the Mountain. The largest Stream seem'd half a Mile broad at least, and five Miles long. I walk'd so far before my Companions, up the Mountain along the side of the River of Fire, that I was oblig'd to retire in great haste, the sulphureous Steam having surpriz'd me, and almost taken away my Breath. During our Return, which was about Three-a-Clock in the Morning, we constantly heard the Murmur and Groaning of the Mountain, which between whiles would burst out into louder Peals, throwing up huge Spouts of Fire and burning Stones, which falling down again resembled the Stars in our Rockets. Sometimes I observ'd two, at others three distinct Columns of Flame, and sometimes one vast one that seem'd to fill the whole *Crater*. These burning Columns, and the fiery Stones seem'd to be shot a 1000 Foot perpendicular above the Summit of the *Volcano*. The 11th at Night, I observ'd it, from a Terrass in *Naples*, to throw up incessantly a vast Body of Fire and great Stones to a surprizing Height. The 12th in the Morning, it darkned the Sun with Ashes and Smoak, causing a sort of Eclipse. Horrid Bellowings this and the foregoing Day were heard at *Naples*, whither part of the Ashes also reached. At Night I observ'd it throw up Flame, as on the 11th. On the 13th, the Wind changing, we saw a Pillar of black Smoak shot upright to a prodigious Height. At Night I observ'd the Mount cast up Fire as before, tho' not so distinctly because of the Smoak. The 14th, a thick black Cloud hid the Mountain from *Naples*. The 15th in the Morning, the Court and Walls of our House in *Naples* were cover'd with Ashes. In the Evening, Flame appear'd on the Mountain through the Cloud. The 16th, the Smoak was driven by a Westerly Wind from the Town to the opposite side of the Mountain. The 17th, the Smoak appear'd much diminish'd, fat and greasy. The 18th, the whole Appearance ended, the Mountain remaining perfectly quiet without any visible Smoak or Flame. A Gentleman of my Acquaintance, whose Window look'd toward *Vesuvius*, assured me, That he observ'd this Night several Flashes, as it were of Lightning, issue out of the Mouth of the *Volcano*. It is not worth while to trouble you with the Conjectures I have formed concerning the Cause of these Phenomena, from what I observ'd in the *Lacus*



*Amsandti*, the *Solfatara*, &c. as well as in Mount *Vesuvius*. One thing I may venture to say, That I saw the fluid Matter rise out of the Centre of the bottom of that *Crater*, out of the very middle of the Mountain, contrary to what *Borellus* imagines, whose Method of explaining the Eruption of a *Volcano* by an inflex'd Syphon, and the Rules of Hydrostaticks, is likewise inconsistent with the Torrents flowing down from the very Vertex of the Mountain.

The Strata of  
a Coal Pit at  
Dudley in  
Staffordshire,  
by Mr. Beller,  
n. 336 p. 541

V. 1. A yellowish Clay, which lies immediately under the Turf. 2. A Blewish Clay. 3. A Blewish hard Clay; the Miners call it *Clunch*. This is one of the certain Signs of Coal. It has in it Mineral Plants. 4. A Blewish soft Clay. 5. A fine-grained Gray Stone: It lies next the former, and is found in some Pits only. 6. A Clay almost like the first, only whiter. 7. A hard Gray Rock; with something like the Impressions of Vegetables, but none distinct. 8. A Blew *Clunch*, like Numb. 3. with Mineral Plants in it. 8. +. This *Stratum* (which is the same with Numb. 13.) was not taken. 9. Coal, called *Bench-Coal*. 10. Coal, less black and shining than the former, called *Slipper-Coal*. 11. Coal, more black and shining, called *Spin-Coal*. 12. A Coal like *Cannal-Coal*, by the Miners called *Stone-Coal*. These *Strata* of Coal have between each of them a *Bat*, of about the Thickness of a Crown Piece. 13. A black Substance, called the *Dun-Row-Bat*. 14. A hard grey Iron Oar, called the *Dun-Row Iron Stone*. 15. A blewish *Bat*, in which the following *Iron-Stone* lyes, called the *White-Row*. 16. A hard blackish Iron Oar, lying in small Nodules, having between them a white Substance; and from thence by the Miners called the *White-Row-Grains*, or *Iron-Stone*. 17. A hard grey Iron Oar, with some white Spots in it, called the *Mid-row Grains*. 18. A black fissile Substance, called the *Gublin Bat*. 19. A hard blackish Iron Oar, with white spots in it, called the *Gublin Iron-Stone*. 20. A *Bat*, in Substance much like that of N<sup>o</sup>. 18. 21. A hard grey Iron Oar, called the *Cannoc*, or *Cannot-Iron-Stone*. 22. A *Bat*, somewhat harder than Numb. 20. 23. A dark, gray, hard Iron Oar, called the *Rubble-Iron-Stone*. 24. The *Table-Bat*, next under the *Rubble Iron-Stone*. 25. A coarse sort of Coal, called the *Foot-Coal*. 26. A black, brittle, shining *Bat*. 27. The *Heathen-Coal*. 28. A Substance like a coarse Coal, but by the Miners called a *Bat*; perhaps because it does not burn well. 29. The *Bench-Coal*. 30. A *Bat* under the last, and is as low (*viz.* 188½ Feet) as they generally dig, though there is a coarse Coal under this.

N. B. Those Substances, which divide the *Strata* of Coals and Iron Oars from each other, are called *Bats* by the Miners: They are generally black, consisting of a Matter peculiar to themselves, and are of a Texture nearest like *Marle*; tho' some of them are fissile, and others have a Substance not unlike Coal mixt with them.



## 2. A Table of the Thickness of each Stratum, and its Proportion to Water, or Specifick Gravity.

Number of the Strata	Thickness of each Strat. Feet. Inches.	Proportion to Water,	Or Specifick Gravity.	By Mr. Fra. Hawksbee.
i.	4 0	as 385 to 192	as 200 to 100	
ii.	5 0	296 168	176	
iii.	24 0	23 9	256	
iv.	9 0	209 106	197	
v.	4 0	583 237	246	
vi.	21 0	401 192	209	
vii.	75 0	683 259	243	
viii.	5 0	223 88	253	
viii+.	1 0	— —	—	
ix.	3 0	7 5	140	
x.	3 0	106 72	147	
xi.	4 0	147 114	129	
xii.	4 0	185 143	130	
xiii.	1 0	408 198	206	
xiv.	0 1	204 67	303	
xv.	0 3	183 72	254	
xvi.	1 3	325 232	334	
xvii.	0 2	781 244	320	
xviii.	2 0	305 129	236	
xix.	0 9	920 266	346	
xx.	1 6	192 76	253	
xxi.	0 6	675 216 $\frac{1}{2}$	313	
xxii.	1 0	428 165	290	
xxiii.	0 6	828 231	358	
xxiv.	2 0	333 153	218	
xxv.	1 0	198 154	128	
xxvi.	6 0	238 141	169	
xxvii.	6 0	298 236 $\frac{1}{2}$	126	
xxviii.	0 1	267 186	144	
xxix.	2 0	314 240	131	
xxx.	0 6	244 133	183	

By which it is evident, that the Gravities of the several *Strata* are in no manner of Order; but purely casual, as if mixt by chance.

VI. The Draught you must suppose the Section of a Coal Country, and to take in about four Mile from N. W. to S. E. and may be applied to the Veins of Coal as they lie at *Faringdon Gourney*, and likewise at *Bishop Sutton*, which last Place is near *Stow*, but in the Parish of *Chem* *Magna* in *Somersetshire*. For discovery of Coals, they first search for the Crop, which is really Coal, though very friable and weak; and some-  
Of the Strata in the Coal Mines in Mendip Somersetshire, by Joh. Strachey, Esq. n. 360. p. 2



times appears to the Day, as they term it; or else for the Cliff, which is dark or blackish Rock, and always keeps its regular Course as the Coal does, lying obliquely over it. For all Coal lies shelving like the Tile of an House, not perpendicular nor horizontal, unless it be broken by a Ridge, which is a parting of Clay, Stone or Rubble; as if the Veins, by some violent Shock, were dis-jointed or broken so as to let in Rubble, &c. between them. The Obliquity or *Pitch*, as they term it, in all the Works hereabout, is about 22 Inches in a Fathom; and when it riseth to the Land is called the *Crop*, but in the North *Basseting*. In the Works near *Stow*, and likewise at *Faringdon* it riseth to the North-West, and pitcheth to the South East; but the farther they work to the South West, the *Pitch* enclines to the South; and *e contra*, when they work towards the North-East. So likewise they observe, as they work to the South West, when they meet with a *Ridg* it causeth the Coal to *trap up*, that is, being cut off by the *Ridg*, they find it over their Heads, when they are through the Ridge; but on the contrary, when they work through a *Ridg* to the North East, they say it *traps down*, that is, they find it under their Feet.

*Coal* is generally dug in Valleys or low Grounds. The Surface in these parts is mostly a red Soyl, which under the first or second Spitt degenerates into *Malm* or *Loom*, and often yields a Rock of Reddish *Firestone*, till you come to four, five, and many times to twelve or fourteen Fathom depth, when by degrees it changeth to a Gray, then to a dark or blackish Rock, which they call the *Coal Clives*. These always lye shelving and regular as the Coal doth. But in these parts they never meet with *Firestone* over the Coal, as at *Newcastle* and in *Staffordshire*. These *Clives* vary much in Hardness, in some places being little harder than *Malm* or *Loom*, in others so hard as that they are forced to split them with Gunpowder: So likewise in Colour, the top inclining to red or grey, but the nearer to Coal the blacker they grow; and where-soever they meet with them are sure to find Coal under them. But to their Disappointment 'tis not always worth the digging. The first or uppermost Vein at *Sutton* is called the *Stinking Vein*. It is hard Coal fit for Mechanick Uses, but of a sulphurous Smell. About five Fathom and half, seldom more than seven Fathom under this, lyes another Vein, which from certain Lumps of Stone mixt with it like a *Caput mortuum* not inflamable, called *Cats-head*, they call the *Cathead Vein*. About the same Depth under this again lyes the *Three Coal Vein*, so called because its divided into three different Coals; between the first and second Coal is a Stone of a Foot, in some places two Feet thick; but the middle and third Coal seem placed loose on each other, without any Separation of a different Matter. These three Veins before-mentioned are sometimes work'd in the same Pit: But the next Vein which I am going to mention is generally wrought in a separate Pit; for tho' it lyes the like depth under the other, the *Cliff* between them is hard and subject to Water; wherefore I have represented a Pit sunk through the three Up-  
per

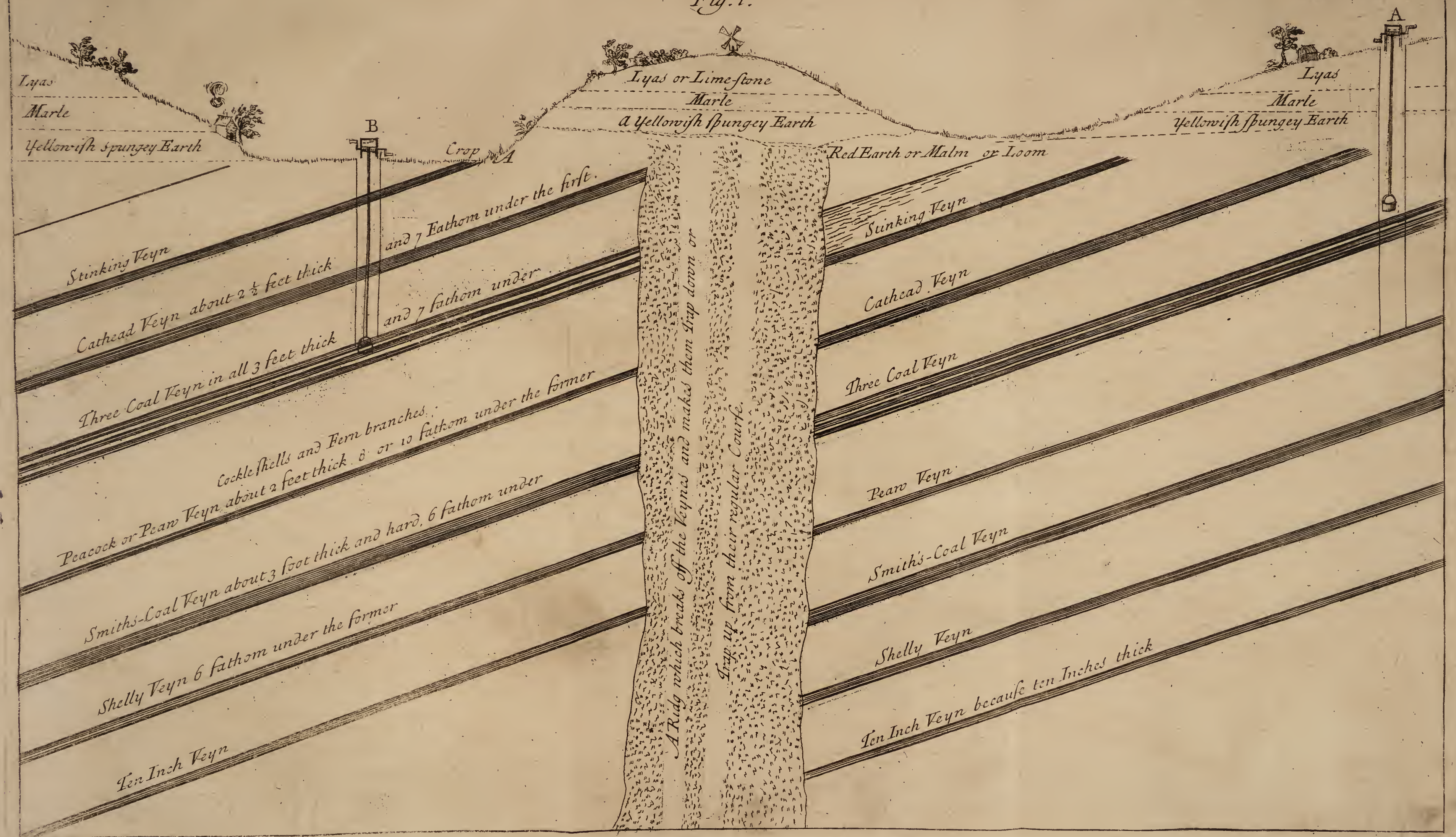






North West

Fig. 1.





per Veins, at *A.* and another sunk upon the *three Coal Veins* only at *B.* *Plate 8. Fig. 1.* and so if they sink on any of the lower Veins they go more to the North West.

Next under the *three Coal Veins* is the *Peaw Vein*, so denominated because the Coal is figured with Eyes resembling a Peacock's Tail, gilt with Gold, which Bird in this Country Dialect is called a *Peaw*. The *Cliff* also over this Vein is variegated with *Cockle-Shells* and *Fern Branches*, and this is always an Indication of this Vein, which, as I before hinted, is always searched for about 15 Fathom to the North West of the former. Under this again between five and six Fathom lies the *Smith's Coal Vein*, about a Yard thick; and near the same depth under that again the *Shelly Vein*: And under that a Vein of 10 Inches thick, which being little valued, has not been wrought to any purpose. Some say there is also another under the last, but that has not been proved within Man's Memory. At *Faringdon* they have the same Veins, which as I am informed, agree in all Parts with those of *Bishop Sutton* before mentioned. But as *Faringdon* lies four Miles South East from *Bishop Sutton*, so, in the regular Course, they would lye a Mile and  $\frac{1}{3}$  deeper than those at *Sutton*. But as in Fact they are dug near the same Depth, it follows there must be a *Trap*, or several *Traps down*, which in all must amount to that depth between the said Works. Between *Faringdon* and *High-Littleton* the same Veins seem to retain their regular Course; but at *Littleton* their undermost and deepest Vein is the best Coal, which at *Faringdon* proves small.

On the other Hand, in the Parish of *Stanton-Drew*, to the North-East of the Coal-Works at *Sutton* aforesaid, about a Mile distant, and in the true Course with those at *Sutton*, the same Veins are found again. But here they wind a little, and their Course or Drift runs almost North, and they dip to the East; which Winding is attributed to *Ridges*, which the Workmen have met with on both Sides, and have occasion'd them to discontinue the Work that way. At *Stanton* they have little of the red Earth or *Malm* on the Surface, but come immediately to an *Iron-Gritt* or *grey Tile-Stone*, which is a Fore-runner of the *Coal-Clives*; in all other Matters they agree with the Works near *Stow*. A little to the Eastward, they have another Coal-work, but the Veins are in all respects different from the former. Their Drift or Course is to the 11 a-Clock Sun, as they term it, they *Pitch* to the 5 a-Clock Morning, and rise to land consequently to the five o'Clock Evening-Sun. They have several Veins, but as yet only three are thought worth working. The uppermost about three Feet thick small *Lime Coal*. The next is about three Fathom under it, about two Feet and an half thick, fit for culinary Uses: the undermost is about the like Depth under the former, only 10 Inches thick, but good hard Coal. At *Clutton*, about two Mile from these latter, in the same Drift, *viz.* almost to the South East and by South, these last Veins appear again. The Surface here is red, and so continues to ten, and sometimes to fourteen Fathom, and in other



other respects agree with the last mention'd Works at *Stanton-Drew*. At *Burnet*, *Queen-Charlton*, and *Brisleton*, they have four Veins which Pitch to the North nearly, and consequently the Drift lies almost East and West. The Surface is red Land generally to the Depth of four or five Fathom. The uppermost is from three to six Feet thick at *Brisleton*, but less at *Charlton* and *Burnet*. The next called *Pot-Vein*, is six Fathom under the former, eighteen Inches thick, all hard Coal. *Thirdly*, The *Trench-Vein*, 7 Fathom under the other, which is from two Feet and half to three Feet thick, all solid Coal. *Fourthly*, *Rock-Vein*, always distinguished by a Rock of Paving-Stone, called *Penant*, lying over it, which Rock is sometime twenty Feet thick, or more, and therefore this Vein is never wrought in the same Pit with the former Vein, but about 200 Yards more to the South, or to Land, as they term it. It's computed seven Fathom under the former.

This is all I can say in relation to the different Veins of Coal and Earth in the Coal works in these Parts; wherein all agree in the oblique Situation of the Veins; and every Vein hath its *Cliff* or *Clives* lying over it, in the same oblique manner. All of them Pitch or Rise about twenty two Inches in a Fathom, and almost all have the same *Strata* of Earth, Malm, and Rock over them, but differ in respect to their Course and Drift, as also in Thickness, Goodness and Use. Now as Coal is here generally dug in Valleys, so the Hills which interfere between the several Works before mentioned, seem also to observe a regular Course in the Strata of Stone and Earth found in their Bowels; for in these Hills (I mean those only that are dispers'd among the Coal-Works before mention'd) we find on the Summits a stony Arable mixt with a spongy yellowish Earth and Clay; under which are Quarries of *Lyas* in several Beds to about 8 or 10 Foot deep, and 6 Feet under that through yellowish Loom, you have a blue Clay, inclinable to Marle, which is about a Yard thick. Under this is another Yard of whitish Loom, and then a deep blue Marle soft, fat and soapy, 6 Feet thick; only at about two Feet thick, 'tis parted by a Marchasite about 6 Inches thick. These Beds of Stone and Marls different from Coals, lie all Horizontal.

A Colliery  
blown up near  
Newcastle,  
com. by Dr.  
Charlet, n.  
318. p. 215.

VII. On *Wednesday* the 18th Day of *August* last, at *Fatfield*, in the Parish of *Chester Le Street*, about three of the Clock in the Morning, by the sudden Eruption of a violent Fire, which discharged it self at the Mouths of three Pits, with as great a noise as the firing of Cannon, or the loudest Claps of Thunder, threescore and nine Persons were destroyed in one instant. Three of them, *viz.* two Men and a Woman were blown quite up from the bottom of the Shaft, fifty seven Fathom deep into the Air, at a considerable Distance from the Mouth of the Pit. One of the Men with his Head almost off, and the Woman with her Bowels hanging about her Heels. The Engine, by which the Coals were drawn up, and is of a great weight, was removed and cast aside by



by the force of the Blast ; and what is more wonderful, the Fish, which were in the Rivulet, that runs twenty Yards under the Level, and at as great a distance from the Mouth of one of the Pits, were in great Numbers taken up dead, floating upon the Water, by several of the Inhabitants. For several Days a very strong and noisome Shell continued to come out of the Pits. I shall endeavour to make the best Conjecture of the Cause of it, that I can draw from the Report or Experience of the Men entrusted with the Management of the Colliery, who being above Ground that Morning, shared not in the common Calamity. In order to which I must acquaint you with the Nature of Coal Mines, which are in general subject to Stith or Sulphur.

*Stith*, as vulgarly so called by the Pitmen, I think corruptly from Stench or Stink, is a want of Air, or rather such a Foulness in the Air, that overcomes the Spirits of the Men, and so suffocates them, as well as extinguishes the Candles.

Sulphur differs in this, that as the other suffers not the Candles to burn, this makes them burn too fast ; and the Flame by the impulsive Quality of the Air, or attracted by the Sulphur, extends it self upwards into a prodigious length, and as a Match lighted for the Discharge of a Cannon, as speedily sets on Fire that Vapour, equally destructive.

Now to prevent both these Inconveniences, as the only Remedy known here, the Viewer of the Works takes the best care he can to preserve a free Communication of Air through all the Works ; and as the Air goes down one Pit, it should ascend another ; but it happen'd in this Colliery, that there was a Pit which stood in an Eddy, where the Air had not always a free Passage, and which in hot and sultry Weather was very much subject to Sulphur : and it being then the middle of *August*, and some Danger apprehended from the Closeness and Heat of the Season, the Men were with the greatest Care and Caution withdrawn from their Work in that Pit, and turn'd into another : but an Overman, some Days after this Change, and upon some Notion of his own, being induc'd as is suppos'd, by a fresh cool, frosty Breeze of Wind, which blew that unlucky Morning, and which always clears the Works of all Sulphur, had gone too near that Pit, and had met the Sulphur just as it was purging, and dispersing it self, upon which the Sulphur immediately took the Fire by his Candle, and so he prov'd the Occasion of the Loss of himself and so many Men ; and of the greatest Fire ever known in these Parts.

VIII. The Burning-glass is three Foot in Diameter ; it collects the Rays of the Sun at ten Foot distance, where it forms a Focus of about three Inches over, which is again contracted by means of another Glass-Lens to an Inch Diameter, and consequently is render'd three times as strong. What was a great hindrance to me in making these Experiments in the Focus of the Glass, was the difficulty I had to find any Matter capable of holding the Metals in Fusion.

*Experiments upon Metals, made with the Burning Glass of the Duke of Orleans, by Monsieur Geoffroy, n. 322. p. 374.*



Charcoal, which is commonly made use of, is indeed a very proper Substance; but it is impossible with it to vitrify any one of the Metals: The Particles of the Metal, when held any long time in Fusion in the Focus of the Glass, dissipate and fly away in Fume or small Particles; and as long as any part remains, that little that does remain, is always Metallick, until the whole be quite evaporated. The reason of which I take to be this. Charcoal is a substance deeply impregnated with oily or sulphurous Parts (if I may so call them.) The first Effect that Fire has upon Metals is to separate the sulphurous Parts: now, if in Proportion as the Sulphur is separated from the Metal, the Body that supports the Metal furnishes it anew with other sulphurous Parts, the other Principles will never separate, and the Metal will always remain Metal. And nothing but the greatest degree of Fire can raise and separate the Sulphur; and that but by little and little, and in very small Particles.

Of all the different sorts of Matter that I made Tryal of, what seem best were the common Coppels and Plates of gray Fire-stone. The Coppels hold the Metal a long time in Fusion in the Focus of the Glass without melting; excepting Lead, which easily runs through them as soon as it vitrifies, and helps to dissolve them. The Plates of Fire-stone bear the heat of the Focus much longer than other Matter; but great Care is to be taken in heating them without breaking, 'till they become red-hot, and when they are hot, the least cold Air makes them melt. Nevertheless this is the only substance that I have used with most Success, to hold Metals a long time in Fusion, tho' with the greatest Caution that was possible, to avoid the Inconveniencies aforementioned.

Of Iron.

I placed in the Focus of the Burning-glass a piece of forged Iron of about a Drachm weight: It turn'd red hot, and its surface was covered with a black Matter like Pitch or Tar. If one withdraws the Iron out of the Focus in this State, this Matter fixes it self on the surface of the Metal, and there forms a small Skin or very fine blackish Scale, which is commonly very easily separated by striking upon it; and that part of the Iron that was cover'd with this Scale appears blacker than ordinary. This Scale is some of the sulphurous part of the Iron that rises to the surface of the Metal when it is ready to melt, and there remains for some time before it exhales. It is plainly this sulphurous part that rises upon Iron and polish'd Steel when heated, and gives them all those different Colours, from a yellow to a Violet, Water-colour or black. If one continues to hold this piece of Iron on the Charcoal, it intirely melts; and at the same time casts forth very bright Sparks in a great quantity, sometimes to above a Foot distance from the Coal. If one saves what flies off during this sparkling, by holding a Sheet of Paper under the Coal; we find that they are so many very small Globules of Iron, and the greatest part of them hollow.

All the Iron that is held in Fusion upon the Coal, flies away in sparkles after this manner, 'till none remains. Sometimes the Metal leaves off sparkling, when the Coal is in part consumed, and cover'd  
with



with a Bed of Cinders, upon which lies the melted Iron. For as the sparkling of the Iron seems to me to proceed from nothing but the oily parts of the Coal acting upon those of the Metal, the Cinders hinder this Oil from passing from the Coal to the Iron, so that it remains quietly in Fusion. But if through any shake, or the like Accident, the Cinders are so removed that the Iron comes to touch immediately the Coal, it will begin to sparkle afresh. Sometimes the Heat that keeps in Fusion the Metal, vitrifies also the Cinders; and this vitrified Matter mixing with the Metal makes a considerable Ebullition. If one at this instant withdraws the Metal out of the Focus, it appears half vitrified, or reduced to a blackish friable Mass. Othertimes this vitrified Matter swims on the surface of the Metal, and there forms it self into Drops, that are sometimes clear and transparent, and other times opake, according as it is more or less mixed with the Metal. If after having let the melted Iron cool upon the Coal, one exposes it again to the Focus of the Glass upon the Stone, it sparkles afresh till it is all consumed; which common Iron will not do, that has not been exposed to the heat of the Focus upon Charcoal. This Sparkling probably proceeds from the sudden Rarification of the oily parts of the Coal, with which the Pores of the Iron are so plentifully saturated; or perhaps it may be caused by the Salts of the Iron acting on the Oil of the Coal.

I exposed to the Focus, upon a Stone-slate, Iron and Steel: they grew red hot, and melted without crackling or casting off any Sparks: they smoak'd very considerably, and the melted Metal turned by little and little like an Oil. After having withdrawn this melted matter out of the Focus, it fix'd in a Regulus like friable Mass, and appear'd sometimes lightly striated, or shot into sharp Points like Needles. Tho' this matter does not appear at all transparent, yet we may look on it as the beginning of Vitrification, or a middle state between Metal and Glass; for it would vitrify in the end like other Metals, if one could hold it a sufficient time in the Focus without melting or mixing with what sustains it: But continuing it long in the Focus, the extream Heat of the Sun, that is necessary to keep it in perfect fusion, melts likewise the Stone or Coppel that contains it, the result of which mixture is a brown or greyish sort of Enamel. We may then take this Regulus Mass to be a half vitrify'd Iron, by reason it is depriv'd of great part of its Sulphur. If one adds to this Mass a Sulphur like that which was taken from it, from being friable it turns very hard and malleable; and the dulness it had before, changes to the brightness of a Metal. This is what I have experienced in exposing again this matter to the Focus upon Charcoal: it melts, and so continues a considerable time in fusion without sparkling, but at last it sparkles with the same briskness as Iron itself; and when withdrawn from the Focus, appears nothing different from melted Iron.

It appears from these Experiments, that Iron contains a sulphur or oily Substance, that renders it bright, malleable, and easy to melt. That this Sulphur is raised by the Fire of the Sun, when the Metal is for



some time held in fusion in the Focus of the Glass. That it may be raised by the flame of common Fire, which though not strong enough to melt the Iron, yet is able to reduce it to an Eschar or sort of Rust. That Iron deprived of this sulphurous part, melts into a Regulus, or brittle and friable Mass, in colour much like Antimony. That if one can hold a sufficient quantity of this Matter long enough in the Focus by it self, without melting or mixing with the Body that contains it, it perfectly vitrifies. That this Glass or metallick Regulus, with the help of a little Oil, returns to its former state of a Metal. That it reassumes this metallick Form upon Charcoal, by drawing thence this oily Substance. That in short, This oily part contained in the Coal, is little different from the Sulphur of Iron. Nevertheless we must imagine it to differ in some Particulars; in that melted Iron, that has been saturated with it, crackles and sparkles very much when melted again upon the Stone or Coppel. Iron being the only Metal in which I have observed this sparkling, I take it to be a Property peculiar only to Iron and not to any other Metal. Perhaps we may attribute it to the vitriolick Salt that this Metal so plentifully abounds with, which is very greedy of Sulphurs. To this same Greediness also, with which the vitriolick Salt of Iron absorbs the oily part of the Coal, we may attribute the easiness with which Iron consumes the Coal; for there is no other Metal that so soon waists the Coal in the Focus of the Glass, as Iron does. Iron is the only one of the four imperfect Metals, on which vitrified Drops arise while it is in fusion upon the Coal.

*Of Copper.*

Copper exposed to the Focus of the Burning-glass, at first turns white on its surface, and afterwards grows black, and is covered with a kind of Skin, or black furrow'd and uneven Scales, till at last it quite melts. I have withdrawn this Metal out of the Focus as soon as this white colour has appear'd, and after it has been cold, found nothing extraordinary on its surface, which has again by little and little recover'd very near the same colour as it had before. I have not been able to discover from whence this white colour proceeds; unless we may attribute it to some Volatile Arsenical Salt contained in the Copper, and driven by Extremity of heat to the surface of the Metal; or whether it purely proceeds from the Alteration that is made in the grosser parts of the surface of the Metal when it begins to melt. The black colour that Copper afterwards takes, seems to be caused by the sulphurous Matter that melts first in Metal as well as Iron, and is raised to its surface by the extream Heat. I placed a piece of Copper in the Focus upon Charcoal: It melted, and emitted a very thin fume, and by little and little diminished till it was all evaporated.

I put a piece of red Copper on a Coppel into the Focus of the Glass: it melted, and sent forth some thin Fumes; and after it had been some time in fusion, it turn'd Liquid like an Oil. I withdrew this melted Matter, and as it grew cold, it fix'd into a Regulus of a reddish brown colour, which was hard, brittle, and not ductile under the Hammer. If



one breaks it, it turns into a red Powder like Cinabar of Antimony; and when view'd with a Microscope, appears so many little, red, transparent Grains like small Rubies; insomuch that one would readily take this Regulus to be a deep colour'd red Glass. I endeavoured to make this vitrified Copper spread abroad in melting, by mixing it with common white Glass; for which end I powder'd some of this vitrified Copper and common Glass, and mixing them melted them together; but the Mixture when in fusion took at first a beautiful green colour, and continuing it longer in the Focus, it turn'd blewish. I believe we may attribute this change of Colour to the Alkali Salts of the Glass acting on the Particles of Copper; for those Salts usually draw a green or blewish Tincture from this Metal.

To preserve therefore this red Colour of the vitrified Copper, when mix'd with common Glass, I made use of this Expedient. I melted in the Focus upon a Coppel a piece of Copper, and as soon as it began to vitrify I cast upon it some common Glass; as soon as the Glass was melted I took them together out of the Focus without confusing them; and as soon as they were cold, separated the Regulus from the Glass as well as possible; and pick'd out of it some pieces of the Glass, loaded with some very small red transparent Particles of the Regulus. This vitrified Copper is then nothing but Copper deprived, by means of heat, of the sulphurous part, that gave it the form of a Metal. A Proof that this metallick form proceeds from nothing else but this Sulphur; is, That if one exposes this vitrified Copper to the Focus upon Charcoal, it reassumes in a little time the Colour and Consistence of melted Copper; and as it grows cold, fixes into a good red malleable Copper, as fine and hard as it was before it was vitrified.

It follows from these Experiments, that the Basis of Copper is a red Earth susceptible of Vitrification. That this Earth receives its metallick Form from a sulphurous substance, in appearance no ways different from the Oil of Vegetables or Animals. That one may deprive Copper of this Oil, by holding it long enough in the Focus, or by calcining it in the Flame of common Fire. That Charcoal restores again this oily Part to Copper, and at the same time its metallick Form. It appears further, that the Oil of the Coal has not so considerable an effect upon Copper, as it has upon Iron.

Copper expos'd a long time to the Focus upon a Stone or Coppel, fumes very much, and diminishes in weight very considerably. I don't think that this fume is only the sulphurous part of the Metal, the Evaporation of which must be insensible; but I believe that with this Oil there is mixed a great deal of the earthy, vitrifiable part of the Metal, which the heat of the Sun sublimes and raises in Flowers.

Tin expos'd upon Coal to the Focus of the Burning-glass, melts, and of Tin emits a gross, white, thick Fume, until it is all consumed in Vapours. If one melts Tin upon a Coppel in the Focus of the Glass, it fumes very much, and its surface is cover'd with a white rarified Calx; on which by  
little



little and little arises a Tuft, or heap of sharp, needle-like, transparent, chrystalline Particles, consisting of an infinite number of small Points. If one continues to hold this Mass in the Focus upon the Stone, these Chrystals at length leave off fuming, and remain fixt, while the Stone melts and vitrifies.

I took Calx of Tin, which is Tin reduced to a grey Powder by means of Fire, that has taken away by Calcination great part of its oily Substance, and exposed it on a Coppel to the Focus, where it fumed again very much, and was reduced into sharp chrystalline Particles consisting of other small Points. In re-exposing these chrystalline Particles to the Focus upon Charcoal, they melted very easily, and took again the form of Tin; the Coal having furnished them with the sulphurous part that the Fire had before taken away. Every body knows, that if one adds any Fat, or the like inflammable Matter, to the Calx of Tin when red hot in the Crucible, it reassumes immediately the form of Tin.

These Experiments show, that Tin contains Sulphur that is very easily separated, since common Fire can do it so readily; and that this Metal calcined, or depriv'd of its Sulphur, is easily saturated again with it from the oily part of any inflammable Matter whatsoever. It proves also, that the metallick Earth which is the Basis of Tin, is a Chrystalline Earth, very difficult to be melted; since common Fire cannot vitrify this Metal by it self, and that the heat of the Sun, in the focus of this large Burning-Glass of the Palace Royal, cannot perfectly melt the Calx into which this Metal is reduced. We may presume that the Chrystallisation, or reducing of this Metal into sharp-pointed Particles, proceeds from the force of the Sun's breaking and melting together into a Sodder (if I may so speak) some of these small Chrystals, by degrees as the sulphurous part leaves them; it not being strong enough to melt them all down together in one intire Mass.

Of Lead.

I took Lead, and held it in fusion upon Charcoal in the Focus of the Glass: it all wasted away in abundance of Fumes. I exposed the like quantity of Lead upon a Stone to the Focus, where it cast forth great quantities of Fumes, and by little and little changed into a fluid Liquor like Oil or melted Rosin. This Liquor, as it grew cold, fix'd into Glass; which has this peculiar to it self, that it is disposed into Plates like *Venetian Talk*, and that it is flabby, soft to the touch, transparent, and in some parts of a greenish or reddish yellow. In continuing this matter in the Focus, it spread upon the Stone like Varnish; and at last penetrating it, help'd to melt it. I placed this talky Earth in the Focus upon Charcoal: It melted, and in a little time after reassumed the form of melted Lead. I withdrew it from the Focus, and having let it cool, found it nothing different from Lead.

These Experiments show, that there is in Lead, as well as the other imperfect Metals, a sulphurous part, that is easily separated by common Fire or the heat of the Sun; and that this Metal has for its Basis a foliated or talky Earth.



I placed Quicksilver in the Focus of the Burning-glass upon Char-<sup>Of Quicksilver</sup> coal, upon the Coppel, and upon the Stone: It all immediately dispersed, and exhaled in a very thick Fume. I exposed upon the Stone to the Focus some *Mercury precipitate per se*, in a degree of heat equal to that of Digestion: It seem'd to melt, but presently dispersed in Vapours: only there remained a small quantity of a very rarified Dust, like a Froath or Scum; but continuing it in the Focus, it melted, and gathered into a yellowish Glass, in which one might distinguish some Particles of Metal like Silver. I exposed some *Mercury Precipitate per se* upon Charcoal: It fumed very much; and as it melted one might see little Globules of Mercury unite and form themselves together upon the Coal, but they dispersed again presently in Vapours.

These Experiments seem to prove, that there is in Quicksilver a Sulphur that may be separated by a very gentle heat, such as that of Digestion. That as soon as this Sulphur is taken away, it loses its Fluidity and Brightness. That the Basis of Mercury is a Calx, or red Earth. That this Calx does not melt into Glass as the Calx of other Metals, because it is too Volatile, and as soon as it melts is evaporated by the heat. That if one restores to this Calx a Sulphur, by exposing it again to the Focus upon Charcoal, it reassumes immediately its metallick Brightness and Fluidity, and becomes Quicksilver.

The Result of all these Experiments is, That these four Metals which we call imperfect, *viz.* Iron, Copper, Tin, and Lead, are composed of a Sulphur or oily Substance, and of a metallick Earth capable of Vitrification. That from this Sulphur proceeds the Opacity, Brightness, and Malleability of a Metal. That this metallick Sulphur does not appear at all different from the Oil of Vegetables or Animals. That it is the same in Mercury as in the four imperfect Metals. That these four Metals have for their Basis an Earth susceptible of Vitrification. That this Earth is different in every one of these four Metals; in that it vitrifies differently in each of them. And that on this difference in Vitrifying depends the difference of Metals.

IX. This Miroir is a Concave 47 Inches wide, and ground to a Sphere of 76 Inches Radius, so that its Focus is about 38 Inches distant from the Vertex of the Glass. The Metal of which 'tis made, is a mixture of Copper, Tin and Tin-glass, whose Reflection has something of a yellow Cast; the Concave surface has scarce any Flaws, and those very small; but the Convex side, which is also polish'd, has some Holes in it.

*Experiments tried with Mr. Villette's Burning Concave, by Dr. Harris, and Dr. Delagulier, n. 360 p. 976.*

Having held several Bodies in the Focus of that Miroir, we observ'd what happened to them whilst expos'd to that great Heat; and with a half-second Pendulum took notice of the Time when any material Change happen'd to them. The Experiments were made from 9 to 12.

N<sup>o</sup>. 1. A red piece of a *Roman Patera*, which began to melt in 3" was ready to drop in 100.

2. Another black piece melted at 4" and was ready to drop at 64".

3. Chalk



3. Chalk taken out of an *Echinus Spatagus* fill'd with Chalk only, fled away in 23".
  4. A Fossil Shell calcin'd in 7" and did no more in 64".
  5. A piece of *Pompey's Pillar* at *Alexandria* was vitrified in the black part in 50" and the white part in 54".
  6. Copper Ore, that had no Metal in it visible, vitrified in 8".
  7. Flag or Cinder, of the ancient Iron Work, said to have been wrought by the *Saxons*, ready to run in 29"  $\frac{1}{2}$ . Here the Glass growing hot, burn'd with much less Force.
  8. Iron Oar fled at first, but melted in 24".
  9. Talk began to calcine at 40", and held in the Focus 64".
  10. *Calculus humanus* in 2" was calcin'd, and only dropt off in 60".
  11. An Anonymous Fish's Tooth, melted in 32" and  $\frac{1}{2}$ .
  12. The *Asbestos* seem'd condens'd a little in 28", but 'twas now something cloudy. Monsieur *Villette* says, The Glass usually calcines it.
  13. A golden *Marchasite* broke to pieces, and began to melt in about 30".
  14. A Silver Six-pence melted in 7" and  $\frac{1}{2}$ .
  15. A King *William's* Copper Half-penny melted in 20", and ran with an Hole in it in 31".
  16. A King *George's* Half-penny melted in 16", and ran in 34".
  17. Tin melted in 3".
  18. Cast Iron in 16".
  19. Slate melted in 3", and had a Hole in 6".
  20. Thin Tile melted in 4", had a Hole, and was vitrified through in 80".
  21. Bone calcin'd in 4", and vitrify'd in 33".
- An Emerald was melted into a Substance like a *Turquoise Stone*.  
A Diamond weighing 4 Gr. lost  $\frac{7}{8}$  of its Weight.

Of Asbestos,  
and incombustible Cloth  
made of it, by  
Signior Campani, n. 273.  
p. 911.

X. Signior *Campani*, after some account of the Name of the *Asbestos* Stone, mentions four sorts, of which he has Specimens in his *Museum*. The first sent him from *Corfica* or *Corfu*, long, of a woody form, of half a Palm length and more, of a whitish colour, something inclining to a reddish. The second of a silverish Lead colour, softer and shorter, about three Inches, this was from *Sestri di Ponente* in *Liguria*. The third (which is the worst of all) is like Scales or *Lamina* one upon another (as he represents it like an Onion) of a blackish earth colour, with some white, black and dark red Veins interspersed, scarce two parts of an Inch *Roman* long, therefore fitter for making of Paper, than spinning or weaving. The fourth sort, given him by Signior *Boccone*, found in the *Pyreneans*, some whereof were a *Roman* Palm long; its Filaments, tho' longer, were yet thicker and rougher; he says also, That he heard of another sort in *Volateranis Montibus*. Next he tells us, He kept it for three Weeks in a Glass-house Fire, but found it unaltered; but it would not preserve a Stick wrapt in it from the Fire; whence



whence he concludes the *Amiantus* loses nothing in the Fire, because it does not burn nor flame, but in the handling it wastes, though not much, as he found by an exact Ballance. Lastly, He proceeds to shew the manner of spinning it, which he tryed thus; first he laid the Stone in Water (if warm the better) for some time to soak, then it is opened and divided with the Hands, that the earthy parts may fall out of it, which are whitish like Chalk, and hold the thready parts together; this makes the Water thick and milky; this is repeated six or seven times with fresh Water, where it is again opened and squeezed, till all the heterogeneous parts are washed out, and then the Flax-like parts are collected, and laid in a Sieve to dry.

Of his four sorts of *Amiantus*, he found that from *Corfica* best, being long and soft; and the *Cyprian* worst; where by the way he doubts whether his was of the best sort, since the *Cyprian* was commended by *Pancirollus* and others which he quotes. But to come more close to the way of spinning it, he first shews a Method discovered to him, which was thus. Lay the *Amiantus*, cleansed as before, between two Cards, such as they card Wool with, Fig. 15 and 16, where let it be gently carded, and then clapt up in between the Cards, so that some of it may hang out at the Sides, then lay the Cards fast upon a Table or Bench, Fig. 17. Take a small Reelee, Fig. 18. made with a little Hook at the end, Fig. 19. and a part to turn it by, Fig. 20. so that it may easily be turned round, this Reelee is to be wound over with fine Thread, then having a small Vessel of Oil ready, Fig. 21. with which the Fore-finger and Thumb are constantly to be kept wet, both to preserve the Skin from the corrosive quality of the Stone, and render the Filaments thereof more soft and plyant: thus by twisting the Thread upon the Reelee about, with the *Asbestos* hanging out of the Cards, some of it will be worked up together with it; by little and little, this Thread may with care be woven into a coarse sort of Cloath, and by putting it into the Fire, the Thread and Oil will be burnt away, and the incombustible Cloath remain. But finding this way of uniting the Stone with the Thread very tedious, instead of the Thread he put some Flax upon a Distaff; and by taking 3 or 4 Filaments of the *Asbestos*, and mixing them with the Flax, he found they might easily be twisted together, and the Thread thus made much more durable and strong: So that there is no need of carding, which rather breaks the Filaments than does any good; open only and separate the filaments after washing upon a Table, and take them up with the Flax, which is sufficient. As to the making of Paper, he says in the washing the Stone, there will remain several short pieces in the bottom of the Water, and of these after the common method Paper may be made. He concludes with the best way of preserving the Cloath, or any other thing made of the Stone, when made, for by reason of its exceeding Dryness it is very apt to break and waste; this is by keeping it always well oiled, which is the only preservative for it; and when the Cloath is put in the Fire, the Oil burns off, and the Cloath comes out white and purified.

Plate 7.



Found in Scot-  
land, by Mr.  
Wilson, n. 276  
p. 104.

2. In the Ground of *Francis Gordon* of *Achindore*, in the Shire of *Aberdeen*, near the *Highlands*, on the side of a Hill of a Heath-kind of Ground, somewhat inclining to what we call *Moss*, in a very small Brook, and hard by it, in the Bounds of ten or twelve Yards, I found a great many of these Stones, some a Foot in length, which appeared plainly like Wood: But because I could not perceive any Footstep of Wood thereabout, neither could any of them be found, except in that very spot of Ground, I could not be persuaded they were petrified Wood. Then I went to cut up the Ground about the place with my Knife, where I found likewise some pieces of the Stone, and very near the surface I got several pieces of a fibrous matter, which my Knife could not cut; this I immediately judged to be an incombustible matter, as it proved afterwards when I tryed it by the Fire. And because I thought it had been always esteemed certain filaments that came off the *Lapis Amianthos*, I resolved to observe more narrowly the Production of it.

When I found some pieces of the Stones very hard in the middle, and the fibrous matter on the outsides and ends, I was inclined to believe that the Flax came from the Stone: but then finding several pieces of the Flax so condensed and pressed together, that at first they appeared to be hard Stones, but being a little wet, the filaments were easily parted from one another. Many more I got, some less and some more condensed, into the nature of a Stone; and all of it, both that which was condensed together, and what was not, was lying about an Inch within the Ground, parallel with the surface so interwoven with the fibres of the Roots of the Grass, that it seemed to me much more probable to believe, that the Lint turned into the Stone, than the Stone into the Lint: especially seeing most part of the Stones appeared so tender and brittle on the outside, that it's hard to believe how they could turn into that tough substance of Flax. The Stones are of different sorts, some are white, the colour of the Lint, and of a very soft substance; so that they may be easily cut with a Knife without blunting it; others are much mixt with a whitish Talk, but most of them are of a greyish colour, and very hard.

As for the Production of the Flax, I think it's hard to determine in this place; because the greatest quantity I found of it, was lying, as I said before, about an Inch at most within the Ground, parallel with the surface, interwoven with the Roots of the Grass, without any Root of it self, but alike at both ends, as if it were cut with a Knife. The Ground wherein it is found is of a greyish colour, about one Inch or two thick, under which there is a black Earth for a Foot in depth. So that I could find nothing in the places where most of it was got, that I could rationally conclude to produce it: But in some other Spots I found much of a talkish Sand, and some pieces of Flax near to it; as also pieces of the Stone much whiter than the rest, and very like Talk; which would incline one to believe that it was produced of it. Yet there being no appearance of any talk in the other places, where most

of



of it was found, I can scarce conclude any thing about the Production of it.

But whatever way it is produced, though I have not examined what has been writ and said of that *Linum* by many, yet it seems to me by what *Pliny*, *Aldrovandus*, and *Olaus Wormius* write concerning it, that this which I found in *Scotland*, is not inferiour to any they speak of, for generally they make it very short, whereas some of this I found 5, 6, 7, and some 8 Inches long.

As for the making of it into Cloath, they all conclude it very hard, which I confesse is true; yet it may be seen by the Experiment I have shown, in making Yarn of it, that Cloath may be made of it also, for the Difficulty is much greater in the one than the other.

3. A singular kind of Stone was dug out of a Quarry in the High-lands of *Scotland*; which after the Rubbish, which lies not very deep, is done away, lies horizontally in a Bed endued with parallel Fibres, with few Interstices, soft at the beginning, and easy to be smooth'd and polished without any Tool, but rather with Sand, or another hard Stone of a blewish Colour, which afterwards hardens so, that it resists the Injuries of the Air, or Prejudice of Fire. When first the Quarrier began to dig it, he was at a mighty loss; for endeavouring to cut and raise it after the ordinary manner with Wedges, and other usual Instruments, it broke and crumbled all to pieces: But afterwards, observing more narrowly the Duct of its Fibres, so to speak, he endeavour'd to cut it with Spades lengthways; and by this means he procured Stones as big as he had a mind, which smoothed very easily along the Tract of their Fibres; but when cut transverse, no Means nor Methods could render them smooth, but their surface remain'd unequal as the Extremities of a piece of Wood. Although as I said, this Quarry has but few Interstices, yet in those it has the true *Asbestos*, of a whitish Silver Surface, consisting of several *fasciculi* with parallel Fibres, like to those of the muscular Fibres of salted Beef, easily separable from each other, pure white, till it becomes so small as the finest Flax, and so ductile, that it may be spun into the finest Thread, whereof it were easy to make the incombustible Cloth, so famous for Shrines among the Ancients. In other places of those Interstices, was likewise to be observed a reddish Substance, near to the colour of *Sanguis Draconis*; but whether Fibrous or not, I cannot inform you, since the Gentleman could not shew me any of it; but added, he believed it might be good for dying. I got a small parcel of the *Asbestos* from him; and he told me, if he had known its value, he could have preserv'd some Pounds of it. I am ready to think the second kind was fibrous too, which might make a very beautiful Cloath, being striped with the other. This whole Quarry may be said to be *Asbestos* of different Colours, the blueish being of a much coarser; and the white and red of a finer Grain.

*A Relation of the same kind, by Dr. Blair, n. 333. p 434.*



*The Icy Mountain Grindlewald, by William Burnet, Esq; n. 320. p. 316.*

XI. I went to the *Grindlewald*, a Mountain 2 Days Journey from *Bern*. There I saw between two Mountains, what one might call a River of Ice, which divides its self in two Branches, and in its way from the top of the Mountain to the bottom, swells in vast heaps, some bigger than *St. Paul's Church*. The Original of which seems to have been this. These Mountains are cover'd all the Year with Snow on their Tops; this Snow has been melted in the Summer, and has fallen to the bottom, where the Sun never reaches: There it has frozen, which every body knows happens more easily to Snow than melted Water. Thus every Year it has encreas'd till it has touch'd the very top. The Reason why the Water has always frozen, though the Sun, in the middle of the Mountain and higher, shines upon it some part of the Day, is that the melted Water goes under the Ice already formed, and there freezes, and so expanding it self raises the Ice above it, and sometimes makes Cracks in it, that frighten the whole Neighbourhood. The reason appears plainly, because the upper Surface being solid, cannot be dilated without making great Chinks, and that with a terrible Noise. They told me, upon the place, that every seven Years the Mountain increases, and the next seven decreases, but I doubt their Observation is not exact. If there is any ground for it, it seems to be that in the hot Summers it increases, and the more moderate ones it decreases, there being then less melted Snow, in which Case it is at present, as we know of late the Summers have been moderate.

*See Phil. Trans. n. 49. and 100. Abridg. Vol. II. p. 465.*

*Observations on the Fossils of Reculver Cliff, by Mr. Stephen Gray, n. 268. p. 762.*

XII. 1. About a Mile from *Reculver*, towards *Herm*, there appears in the Cliff a *Strata* of Shells in a greenish Sand; they seem to be firm, and some of them are entire, but when you go to take them from their Beds, they crumble to Powder between your Fingers; but that which is most remarkable is, that in the lower part of the *Strata*, where the Shells are more thickly dispersed, there lies scatter'd up and down Portions of Trunks, Roots and Branches of Trees; the Wood is become as black as Coal, and so rotten that large pieces of it are easily broken with ones Fingers. I know not what depth these may lye, the *Strata's* surface not appearing above two Foot from the Beach, but I judge it from the superficies or top of the Cliff about 12 Foot. I saw the Stump of one Tree standing upright broken off about a Foot from the Ground. I should have given a more particular account, but cannot at present find the Note I took upon the Place. I shall only add, That the Shells were of the white *Conchites*.

*A Remark, by Sir Hans Sloane, ib.*

2. It is very likely that the black Wood mentioned in this Letter is Oak, which has lain so long as to be turn'd of that colour by the Vitriolick Juices of the Earth, in which it has lain, as Galls and a Solution of Vitriol turn of that colour. I never saw any Oak that had lain any time in any kind of Earth, where Water came to soak into it, that was not



not turned of that colour: and I have seen many Trees of black Wood of great bigness, taken up (as well as lesser pieces) and all of it was Oak. It looks at first taking up like Ebony, is very ponderous, but as it dries, it splits, grows friable, light, and comes to be good for little.

XIII. 1. The state of these Bodies is quite different in your parts *Fossils, by M. Edw. Ihwyd, n. 291. p. 1566.* from what it is in *Wales and Ireland*. In those Countries the Shells are generally *Crystalline*, but with you (and sometimes hereabouts) they are *testaceous*: which difference is doubtless to be attributed to the Soil, and particularly to your Chalk and Flint, which all those Countries want, excepting a small part (I know not by what chance of *Diluvian Dissolution*) got into the *North* part of *Ireland*. But there 'tis remarkable that their Chalk is absolutely petrify'd: I mean, whereas the Flints are here imbodyed in Chalk, they are there in a Chalk-white *Lime-Stone*. And as your Chalky Countries only afford those *Echinits* I have stil'd *Pileatus*, *Galeatus*, and *Cordatus*: So I could never find them in all my Travels but at that Place; from whence in the time of *Paganism* the *Druids* procur'd them, and sold them amongst our Northern *Britains* for Stones of miraculous Efficacy against Perils by Fire and Water; perswading the Vulgar they were generated in *Cocks-knees*; as thousands in the *High-Lands* believe at this Day. And one Fellow had the Impudence to tell me (finding me a little hard of Belief) that he himself had taken one (that his Master had shew'd me) out of a Cock's-knee with his own Hand. —

2. We were surpriz'd at *Oxford*, to find so many *Fossils*, scarce distinguishable from *Sea Shells*: for the Case is otherwise in those Places I searched. We have indeed in these Parts one or two *Fossil Shells* of a *Testaceous* Substance; but in colour they recede farther from those of the Sea than yours. I find by those sent me, that you sometimes find them imbedded in solid Stone: which takes off any Objection some might offer, of their being an accidental scattering of *Gulls*, *Crows*, &c. on the *Harwich Cliffs*. *ib. p. 1567.*

XIV. *Harwich Cliff* is a sort of *Promontory*, which divides *Ormel Haven* from the *Æstuarium* contained between that and *Walton Nase*; *Cliffs and Fossils there, by Mr. Sam. Dale, ib. p. 1568.* it is situate on the Southern part of the Town, about a quarter of a Mile distant or not so much, and contains many Acres of Land. The height of it from the Strand or black Beach to the top, where it is highest, is 40 or 50 Foot. At the bottom of this Cliff, there is a *Stratum* of Clay about a Foot thick, which is succeeded by another of Stone for a Foot more; in this *Stratum* of Stone are imbedded divers Shells (tho' but thinly) as well of the *Turbinate* as *Bivalve* kind, and also pieces of Wood and Sticks, as you may observe by the Fragments thereof, which I have sent you. Over this are divers *Strata* of blueish Clay, of which you have also a Sample about the height of 20 Foot or more; this Clay hath *Pyrites* or *Copperas* Stones sticking in it, but no Shells that I could observe.



observe. Above this are likewise divers *Strata*, which reach to within about two Foot of the Surface, some of which are only of fine Sand, others small Stones and Gravel mixt with Fragments of Shells, of which I likewise sent you a *Specimen*, and in others small Pebbles are mixt; and it is in some of these last mentioned *Strata*, that the *Fossil Shells* are imbedded, which lye promiscuously together, I mean the *Bivalve* or *Turbinate*; neither do the *Strata's* with the Shells observe any order in their lying, being sometimes higher and sometimes lower in the Cliff; and sometimes two or three one above another with other *Strata's* of Sand, Fragments and Gravel between. Above all these is a covering of common Sandy Earth, which is about two Foot thick, in which, in some places are Veins of a Species of *Osteocolla*, though more tender than *Osteocolla Officinarum*, which is brought from *Germany*: This I have adventured to call *Osteocolla Anglicana*, it doth incrust about small Strings like the Fibres of the Roots of Trees, it's of divers Magnitudes, and sends forth Branches here and there, but is so tender, as not to be gotten out of the Earth in any large pieces, Whether like the *German* it appears above the Earth, I never could discover.

Before this Cliff, the Shoar, as far as the ebbing of the Sea would permit my Observation, was rudely paved with Stones, divers of which are vein'd with that sort of Body, which by *Helmont* and other later Naturalists, is called *Ludus Paracelsi*: Of these Stones the Inhabitants have a Tradition that they are form'd by the Clay, which tumbling down from the Cliff, and being washed by the flowing of the Sea, are in a short time converted into Stone; and Mr. *Silas Tayler* in his Manuscript Collections of *Harwich* and *Dovercourt*, (a Copy of which I have) thus writes concerning it. *The washing of these Cliffs discovers a blueish Clay, which tumbling down upon the Shoar, although washed by the Sea at High-water, within a short time turns into Stone: There may be seen some that are new fallen as soft as the Clay in the Cliff, and others that have lain there longer crushed over and hard, but if opened or broke, the Clay still soft in the middle; others that have lain longest petrify'd to the very Heart, and with these the Walls of the Town are for the most part built, and the Streets generally are pitch'd.* How far this is matter of Fact I will not determine, my Stay at *Harwich* being always too short for me to make Observations so critical as this doth deserve; and altho' I must at the same time own that many of the Stones are washed out from the *Stratum* at the bottom of the Cliff, yet I have sometimes been inclined to Mr. *Tayler's* Opinion, who seems to be a Person of Probity and Learning: and also because divers of the said Stones have Cracks or Chops in them, as Clay and Earth will have by being expos'd to the Sun; and there is yet [*Anno 1702.*] lying upon that Shoar a Stone, in which a large Pile (perhaps of Oak) such as was formerly made use of there to preserve the Cliff from the Injuries of the Sea, doth evidently appear to be imbedded; which can owe its Situation to no other Original, than by being press'd into the Superficies of the Clay while soft, and petrifying with



with it, which being square, takes off an Objection, which some might make had it been round, of its being lodged there in the general Deluge.

I am not insensible that this manner of Petrifications is not only different from the common Methods Nature useth in that Operation, but also thwarts the Opinions of divers learned and ingenious Men, and it was strenuously oppos'd by the Reverend Mr. *John Morton* of *Oxendon* in *Northamptonshire*; who in his Letter, dated *August 4, 1699.* says thus; 'At *Harwich*, under the Cliff, upon the Sea-shore, there is a *Stratum* of a *Clayie-stone*, which is cover'd here and there with ragged Stones of a cloer Texture, which was formerly (I conjecture) another entire *Stratum*, but is broken thus by the tearing of the Waves. The *Clayie-stone Stratum*, Mr. *Dale* and Mr. *Luffkin* my Companions were of opinion had been formerly a softer Substance, but was daily petrify'd by the Sea-Water. Having argued a little about it, when turning to the Cliff, I found a *Stratum* there, of the very same sort of *Clayie-stone* with that upon the Shore; yet the Sea-water very seldom comes up hither, unless by Storms and at Spring Tydes. I broke a little piece off, and shew'd it to you, and then you was convinc'd (I think) it was not petrify'd by the Sea-Water, but in its natural State. And I have often, I assure you, met with just such a sort of Stone in many of our *Stone-Pits* here, in Inland Countries. It appears to me, that the Water should have rather softned than hardned the Stone upon the Shore, tho' by washing away the looser *Clayie* matter and other earthy Stuff, that is sometimes left upon it at the Ebb, it might seem to be a sort of *Petrification*; and occasion this Mistake. As to *Petrifications*: I've only observ'd these three sorts. First, *A Stony Incrustation* upon Sticks and any thing that lyes in the Way, in the Petrifying Springs; the Earth in those Waters is usually intermixt with Particles of Stone, that trickle down into it with Water, and are there detain'd. Of this first sort you have doubtless many instances in *Essex*, and I think there is one at *Harwich* Cliff; though this in my Opinion is not so properly called a *Petrification*. Secondly, The second sort is that which is perform'd by the *Permeation* or *Insinuation* of the finer sorts of Stony Particles, as it is in the Case of some of our Petrifying Waters, (I believe) particularly that at *Knaresborough* sometimes; the Stony Particles however of the *Knaresborough* Spring are very fine. And many of the *Fossil-Shells* have undergone the same fate. Thirdly, The third, which indeed is a *Petrification*, properly so called, is often met with on the sides of Caves and Grotto's, as at *Pooly-hole* in the *Peak*, and in the *Fissures*, and *Clefts* of *Mines* and *Quarries*. Of this kind are the several sorts of *Fluors*, the *Lap. Stillatitii*, *Stalagmitæ*, &c. that we meet with in the *Fissures*, and *Hiatus's* of the Earth. These are continually growing (as they vulgarly say) that is, are receiving an additional increase of real and solid Stone, as is observed in many Caves in the *Peak*, &c. This I take to be perform'd

in



' in such a manner as the *Incrustations* are, viz. the Particles of Stone  
 ' are brought along with the Water, as their *Vehicle*, and are deposited  
 ' at length upon the sides of the *Cave* or *Fissure*, (this is matter of  
 ' Fact, that there is always a watry Stream, and usually Water a trick-  
 ' ling down upon the sides of those *Caves* :) but here, the Particles of  
 ' Stone are extremely minute and fine, and do thereby naturally con-  
 ' cert and joyn together very close; whereas in our *Incrustations* the  
 ' Particles of Stone being grosser, the Stone is rough, and coarse, and  
 ' friable. And this I leave to your Judgment if it be not a more reaso-  
 ' nable *Hypothesis*, than that of Dr. Plot in p. 33. of his *History of Ox-*  
 ' *fordshire*, viz. *That the very body of the Water is turned into Stone as*  
 ' *it drops down from the Rocks.* I know not indeed of any other sorts of  
 ' *Petrification* than these I have already mention'd. As to that *Hypothesis*  
 ' of the *Transmutaion* of a *Stratum*, e. g. of Chalk to Clay, of Coal to  
 ' common Stone, or the like, I must confess I never met with any thing  
 ' in nature which would countenance it, that is, such a *Transmutation*  
 ' in the Bowels of the Earth. Nor is there any thing that proves it,  
 ' that ever I have met with in any *Natural Observations*. Only some  
 ' will guess and fancy such a thing, but for making it out, I am sure I  
 ' am no more able to do it, than to make the *Philosophers Stone*, what-  
 ' ever they are'.

A late Author is of opinion, That *this Bed of Stones was the Founda-*  
*tion of the Loomy Cliff, where the Cliff has been washed away or cut : And*  
*that they are the Production of a Vitrioline Juice in Conjunction with the*  
*Loam ; as the common Copperas Stones are by the same Juice in a Gravel,*  
*and that the latter were only to be found where the Cliff was gravelly,*  
*and not where the Loam is.* How far these Stones are the effect of a  
*Vitrioline Juice*, I will not determine, but this I can affirm, That I  
 have now by me some of the *Pyrites* or common *Copperas Stones*, which I  
 did pick out of the *Clayie Stratum* of this Cliff, in which they may be  
 frequently met with, as mentioned in its Description. Nor do I re-  
 member at any time to have observed these *Stones* to be *invested with*  
*either Gypsum or Trichitis*, as the same Author affirms, but with the  
 aforesaid *Ludus Paracelsi*, and some other sorts of *Lap. Stalagmitæ* fre-  
 quently. I shall crave Leave to make some Remarks on the positive  
 Assertion of the aforesaid Author, concerning the imbedding of these  
*Fossil Shells* in this Cliff, and the Alteration of the Channel, viz. *That*  
*this Bed of Shells, which covers the Cliff, was carried thither at the mak-*  
*ing of the Harbour or clearing of it.* For the Harbour or Channel there  
 is artificial and of no old Date, the Current having been formerly on the  
 other side of Languard Ford, which then stood in Essex. Against the  
 first part of which, although many Reasons might be given to prove  
 the contrary, I shall only trouble you with the following, and as our  
 Author begs the Question, *How else could the Shells lye a top of this*  
*Cliff ?* So I shall also ask him, why the same Strata of Sand, and Frag-  
 ments of Shells, with the same *Fossils* imbedded, are to be found at  
 Walton



*Walton Ness* on the other side of the *Æstuarium*, which is 5 or 6 Miles broad from *Harwich*, as likewise at *Bawdfey Cliff* in *Suffolk*, which is 8 or 9 Miles distant, and in other Cliffs on that Shore, where I have met with them. A second Question may here be askt, How it comes to pass that none of those *Buccina Heterostropha*, (whereof such plenty of their *Exuvia* are in all the Cliffs hereabouts) are not now to be found in this Channel, nor the adjacent Seas? (where I have divers times been a fishing) for I cannot think the clearing this Harbour could have destroyed all that Species of Shell-Fish, whereof there was then such plenty; and therefore some other Original must be allow'd them, than what this Author has assign'd. Nor can I allow the *Harbour* here to be *Artificial*, because so great a Work as this is, *viz.* the making a Channel 2 Miles wide, as it is in this place, would not have been without some Record thereof in History, and besides, the Earth, &c. which must arise by this Work, must consequently have made a much greater Hill than the Cliff ever was; and another Doubt will from hence arise, why the Workmen should bring all the Earth, &c. to this side the Channel, and not lay some thereof on the other, as it's plain they did not. The Ground on which *Landguard Fort* stands, as far as *Walton Colnefs*, which is about three Miles, is only a sandy Level or Beach, which I believe hath in time subsided there, as may be observed at the Mouths of other great Rivers. And as to the Argument which our Author brings of *Landguard Fort* being accounted to stand in *Essex*, to confirm this Hypothesis of the Change of this Channel; it will be of no force with any one which doth but observe, that not only parts of Parishes, but likewise of Counties, are often divided from those Parishes and Counties to which they belong, and included in others, of which I could give you many Instances, *e.g.* a part of *Kent* is on the *Essex* side the *Thames*; and in *Oxfordshire* the Parishes of *Shilton* doth belong to *Berkshire*, *Daylesford* to *Warwickshire*, *Compton* to *Gloucestershire*, and *Stratton-Audley* to *Buckinghamshire*, although all included in the other: And there is a Farm which doth belong to the Parish of *Braintree*, that is separated from it at least two Miles, and many others might be given, but let these suffice. And to me a probable Reason of this Forts being accounted in *Essex*, is; the Sands here subsiding made at first I suppose an *Insula*, which being nearest to *Essex* was accounted of that County; or 2dly, the Island so made belonging to none but the Crown, it was at the pleasure of the King's Officers to call it of which County they pleased. Nor was it the Gentleman in *Cambden's* Ignorance that made him mention these Stones for *Petrifications made by the Sea*, for Mr. Tayler in his aforesaid *Collections* did not omit the Tradition the Inhabitants of this Town have about the Alteration of the Mouth of this Haven. It's generally believed, says he, That *Stoure* did formerly in a straighter Current (than now it doth) discharge it self into the Sea, about *Hoasley-Bay*, under the *Highland* of *Walton-Colnefs* and *Felix-Stow* in the County of *Suffolk*, betwixt whom and *Landguard Fort* are (as they are reputed) certain remains of the



old Channel, which the neighbouring Inhabitants still call Fleets, retaining at this Day the Tradition of the course of the Water, and the entrance into this Haven to have heretofore been by and through them.

And I am of opinion that this Tradition is matter of Fact, having before hinted to you what Mutations the Mouths of great Rivers daily undergo by the Lodgment of Sands, &c. which may be assigned as a better reason for this Alteration than that of our Author, *i. e.* that it was Artificial; and the yearly washing of the Cliff on the *Harwich* side, doth likewise add to its probability; it being a constant Observation, that where the Sea gaineth on one side, it loseth on the other. And that this Level was so made I am confirm'd by the modern removal of the Fort, more towards the Point, more Sands, I conjecture, being added after the old Fort was built. The Spring mentioned by Mr. *Edmund Gibson*, in his *English Edition of Camden*, from the aforesaid Manuscript of Mr. *Silas Tayler*, is a very small inconsiderable thing; nor could I observe that it did petrifie or incrustate either pieces of Wood or Sticks, but I have a piece, which I broke off from a large Pile upon that Shoar, which was petrified so far as it was droven into the Earth, and the Sea Water came; and do suspect there yet remains some others of the same. And of this sort I believe, is that large piece sent from hence, which Mr. *Tayler* mentions to be reserved in the Repository of the *Royal Society*.

† Now Lord  
Bishop of Lin-  
coln.

I have already taken notice, that the *Fossil Shells* are imbedded in a loose *Stratum* of Sand, Gravel, &c. which may serve to demonstrate that their *Matrix* is not a *Clay Bed* upon the top of the Cliff; as likewise for another Argument to evince that they could not be there scattered by *Crows*, *Gulls*, and other Sea Fowls, as well as that some of them are likewise bedded in Stone at the bottom of the Cliff; and although some few of them may be met with upon the top of the Cliff, yet it's only where the Earth has been broken by digging of Ditches, &c.

River and  
other Shells  
found under  
Ground, by  
Dr. Morton,  
n. 305, p. 2210.

XV. Causing one to dig into the moorish Ground in *Mears Ashby* Field in *Northamptonshire*; we found a small number of Snail Shells of various kinds buried there. At about a Foot in depth they lay very thick; and sinking still downwards, the number rather encreased till we came to the depth of about three Foot. 'Twas troublesome to sink deeper on purpose; but we made Tryals for a considerable extent of Ground, *viz.* about 250 Foot in length, and 130 in breadth. Besides, the same Shells were cast up in several places, at distance, by Moles. What we principally observed in this search was 1. A moist Moorish black Earth, in some places a Foot and a half, in others somewhat above two Foot in thickness. The lower half of it is blacker and denser than the upper half, of a Bituminous Nature, and has all the Characters of Peat-Earth. Besides Shells we found Stalks and Leaves of Grass, and also of many Kinds of other Vegetables repositied as usual in like Bituminous Moors, in other parts of this Island. 2. White Earth; so at first we



we call'd it : But upon cloſer Inſpection it appeared to be little more than Hay half-waſted. So deep as we funk into it, we found it every where copiouſly interſpers'd with Shells. I diligently ſearch'd this place, but cou'd not meet with any live ones of any kind whatever on the Surface.

The Fossil Shells were ſome the *Exuvia* of Land-Snails, the reſt of River or freſh Water-Snails : Of the former there were the three following kinds. 1. A ſmall *Buccinum* of five Wreaths, the *Buccinum exiguum quinque anſractuum*, Tit. 7. *Liſt. in Traſtat. de Cochleis Terreſtr. Angl.* A kind obſerv'd by Dr. *Liſter* to live in Moſs upon old Garden Walls at *Eſtrope* in *Lincolnſhire* ; by my ſelf, at the Moſſy Roots of old Trees in many of the *Northamptonſhire* Woods, as alſo amongſt Moſs upon the Boggy ſides of ſeveral ſtanding Springs. 2. A *Cochlea* of the compressed kind, but not ſo much compressed as ſome of them are. It has five Wreaths and a ſmall circular *Sinus* in the Center. This, if it is not the *Cochlea umbilicata*, &c. N. 79. *Liſt. Hiſt. Conchyl. Lib. I.* has not hitherto been mention'd by any Writer; tho' common enough in the Woods in *Northamptonſhire* : I found a greater number of them, for the Compaſs of Ground inclos'd in the Earth, than ever I have done in any of the Places where they naturally breed. 3. The *Cochlea citrina* Tit. 3. *Liſt. de Cochl. Terreſtr. Angl.* The common ſtrip'd Snail-Shell. But moſt of theſe in the Moor are white, of the colour of the Shells that have been a long time dead. In ſome I ſaw faint Footſteps of their former Stripes. Moſt of the Shells of this kind were lodg'd about 4 Foot deep.

We met with only two different kinds of River-Shells. 1. A Perewinkle Shell of three Wreaths, generally leſs than the *Buccinum trium Spirar.* Tit. 24. *Liſt. de Cochleis Fluviatil. Angl.* There were a greater Number of theſe buried in the Moor than of any of the former kinds. 2. A Perewinkle Shell of five Wreaths, much ſmaller and more prominent than thoſe of the *Buccinum longum ſex Spirarum* Tit. 21. *Liſt. de Cochl. Fluviat.* 'Tis otherwiſe very like that *Buccinum* in the Faſhion of its Wreaths. It has not yet been deſcrib'd by any Author. We find the kind now living in one of the *Northamptonſhire* Brooks call'd the *Iſe*.

The Moorish Ground wherein theſe Shells were buried extends from near the top to very near the Foot of a ſmall Hill. Above the Moor, upon the top, and at the Brow of the Hill, is a ſandy Soil of a reddiſh Colour. The whole Face of the Moor is plain and even, conformable to the reſt of the Hill not thus moory of the ſame Declination with it, and appears to be in a natural and undiſturb'd State, as much ſo as any of the Slades in the neighbouring Fields; except that three or four Trenches have been cut through it of late. 'Tis evident theſe Shells were left at the Deluge, when thoſe from Sea were alſo reſited at Land ; and not buried ſince by Deterrations from the Ground above. For then the uppermoſt parts of the Moor muſt have been cover'd with a reddiſh Sand; ſuch as the Ground is for the Main compos'd of; but nothing like that appears in the Shells of this Moor. Beſides here are



dug up Shells that in all likelihood never bred there, but are Inhabitants of a different Soil: particularly the strip'd Snail Shell; for these Animals have peculiar Soils, and affect particular Regions.

Of Amber, by  
F. Camelli,  
n. 290. p. 1591

XVI. Quis opinioni, *Ambari* originem ab arboribus deducendum, utpote verisimili ac valde probabili non subscribit? More fungorum etenim generari valde dubium est. Algas, aut maris recrementitiam putrilaginem materiam esse posse *Ambari*, non facile crediderim. Herbas aut arbores resiniferas in ipso mari enasci necdum constat. Bituminis, aut terræ genus esse, non est verisimile. Fictitium esse, falsum est. Avium sterces, Elephantis semen, Balanæ, aut alterius Piscis esse liquorem, hepar, sperma, aut excrementum, fabulosum videtur. A *Balanis* nihilominus, aut aliis Cetaceis, aliquando Ambarum tanquam nutritioni prorsus ineptum evomi, (quod & Odoardus Barbosa annotat) in earumve œsophago, aut ventriculo nonnunquam ut indigestibile inveniri lubens concesserim, siquidem hujuscemodi monstrosa oblatas offas, nequaquam ut pueri poma diligere, aut prælibare solent, sed quicquid faucium eorum hiatui influxerit ingurgitant. † Resinosum itaque salvo aliorum judicio liquorem, quem *Indi* variarum provinciarum *Agacahac* l. *Hagac hac*. *Bintogo* l. *Bintoco* *Apitono* & *Malibaho*. *Cayancang*. & *Bolotic* alii vocant, quemve unum eundemve cum ea sicca, & indurata resina, quæ mihi de montibus *Ilocos*, & *Paynan* in magnis allata fuit fragmentis esse judico: *Ambari* legitimam materiam esse suspicor. Verum tempestuosa oborta procella, & pluviarum continuatione, universali facta inundatione a mediterraneis latebris, ac & spineta inaccessibilium montium jugis, torrentium impetuoso, ac versabundo cursu præcipitanter in mare delatum, ibidemque a decumana fluctuum exagitatione, & concussione æstuante marina aqua nonnihil emollitum ac elotum, beneficio particularum Salis marini, nec non Solis demum accedentibus ardentissimis radiis, ita immutatum, elaboratum ac præparatum, ut tandem placato turbine ad littus refluxis propulsus fluctibus a resina recenter ex arbore collecta, aut etiam tractu temporis in montanis desiccata, distinctissimam violento nempe hocce beneficio acquisitam præ se ferat formam †, eamve prouti scilicet, plusve minusve temporis aqua marina maceratus, fluctuum concussione elotus, ac Solis excoctus seu dealbatus fuerit ardore, magis aut minus candidam. Verum communiter non nisi postquam Pluviarum continuatione mediterranea inundentur, & terribilium ventorum furia exagitatum fuerit mare, horrenda fluctuum concussione abyssos ipsos, & sinuum ac concavitatum latebras everrendo sordes tanti ponderis in littus rejiciuntur. Hujus conjecturæ certum, & evidens præbent Argumentum Anno 1694. Januario *Manilam* allata *Ambari* frustra grandiora, solida, pura & heterogeneis carentia, in littore circa *Palagpag* collecta. (Nota, post sub finem Februarii 1693. horribilem exortam turbinem) erant autem partim coloris opacioris *succini flavi*, seu facie gummi *Arabice*: vitro cristallino vix non pellucidiori de *Ilocos* missæ resinæ magis in luteum vergentia: Resinæ vero de *Paynan* allatæ propemodum similia, sed minus

† Idem l.  
consimilem.

† Barbosa aeris,  
Soli, & Lunæ  
continuo exposi-  
tum resinare  
tradit.



minus odora, usta videlicet, igne ut hæc & altera facile liquescentia, & lapideæ ferme duritie, ita ut nec culter nec dentes signum imprimerent. *Partim* seu latere uno ex candido grisea, varie fissa, friabilia quidem, sed omni hucusque a me viso *Ambaro* solidiora. Pro *Ambaro* autem omnium optimo genuino, & legitimo divendita fuerunt. Huic meæ opinionî non invitus objecerat adversarius, non posse esse *Ambarum* hujuscemodi arborum resinam, eo quod frustra maxima reperta fuerint; cui respondebam fieri posse, ut varii hujus resinæ glumi obvios inter fluctuum recursus, aut etiam torrentium decursus, utpote homogenei, & tenaces fociantur, sibi cohæreant, agglutinentur, & in frustra majora denique abeant, ac conglomerentur. Et quidni magna possibile est reperiri hujuscemodi resinæ frustra, cum hujates montes arbores resiniferas incredibilis alant vertitatis, & ad *Pilis* & *Lauvan* caudices sæpius centenarii colligantur resinæ, & fragmenta de *Flocos* ac *Paynan* allatæ resinæ sane maximum fuisse glomum, unde desumpta fuerant, testentur. *Fran. Combes* † refert † *Hist. Inf. Mindanai* f. 15. in littore *Iolo* (*Batavis* Insula *Margarifera*) fuisse repertum frustum *Ambari*, bovini corporis trunco majus, sed resinæ ordinariæ loco vix non fuisse consumptum. *Idem* referre videtur *Fran. Colin* † scribens circa *In-* † *Hist. Philip-* *sulam Iolo*, frustum *Ambari*, grisei, & optimi inventum fuisse ultra ducen- *pin. f. 49.* tas libras pendens. Et *idem Ignatius Alzina* in *Hist. Bysaiarum* recensere puto, qui dicit in *Iolo* frustum fuisse collectum corpore humano crassius, & duplo longius vilique ob copiam distractum fuisse pretio. An. 1632. ad promontorium *Sancti Spiritus* in *Costa de Igbabao* *ambari* fragmentum 55 circiter librarum inventum fuit, cujus uncia 30 Imp. quia sane optimum fuit, divenditum est. *Indus* siquidem, cui fors obtigerat, tres impleverat corbes, quorum duos ob cognitionis, & exinde estimationis defectum, domus suæ illuminandi gratia, resinæ loco insumpserat. (his usibus antiquitus, plerumque *Bysaians*, *Ambarum* a resina non distinguendo deserviebat.) *idem* facturum cum corbe tertio, nisi hospes magis versatus ex odoris fragrantia, fumi recta ascendentis distinctivo, non resinam vulgarem, sed nobilissimam, seu *Ambarum* esse prodidisset. *Caspar Bayam* circa 1680. inter *Aden* & *Meccam* in alto mari *Ambari* truncum prægrandem obvium habuit. In *Bangahun* vetula conchylia legens, frustum magnitudinis brachii invenit, pro resina odorifera ordinaria habuit, (nam variae & multæ resinæ odoriferae species a mari in littus propelluntur, ut *Batete*, *Ambarum* redolens, quam *Ambarum* quod vocant nigrum esse cenfeo; eo quod curatum, non semel pro viliori divendatur *Ambaro*. *Dairiangao*, *Raporago*, *Benzoini* redolent. *Tangay Samato*. Aliis *Samata*, liquidambram, aut balsamum spirantes.) suffumigiis destinavit, & ferme in totum antequam quid rei esset edocta fuisset, consumpsit. *Ambarum* non raro valde tenax, & picis liquidæ modo molle inveniri multi affirmant, quod & *Fran. Combes* insinuat dum scribit, aliquando in littore liquorem mollem, & recentem colligi, qui asservatus, nec non beneficiatus optimum esse deprehenditur *Ambarum*. Communis autem & vulgaris est opinio, quod & *Hieronymus de Huerta* cum *Fran. Combes* affirmat, *Ambarum* crudum aut recenter collectum, fragranti carere odore: *Joh.* nihilo;



† E. 90.

\* In Hist.  
Chilensi.

Aët. Med.

Philos. Haf. An.

1671 Obs. 57.

f. 113.

nihilominus *Botera Benes*, † *Ambarum* in *Ava* prostant, & non adulteratum odoris esse summe fragrantis, ac acuti, ut naribus admotum illico sanguinem profluere faciat. *Alphonsus de Ovalle* \* scribit, *Griseum* esse odoris suavis, *nigrum* acutioris, differentiam vero hanc odoris & coloris inde provenire, quod *nigrum* *griseo* breviori tempore in mari, ac Soli expositum fuerit. *Sennertus* de Bitumine, *Ambram* odoratam, Bitumen esse ex amaris fontibus manans, & in summo mari, aeri expositum densari & coagulari, ut succinum, censet. Dealbationem itaque *Ambari*, & durtiem, ac densitatem sali, salinisque maris particulis, prouti *Succini Soli* ditatem *Thomas Bartholinus*, adscribemus. *Ambræ griseæ* valde candicantis, & ut vocant firmissimæ, asservo partem varie excisam & atterebratam quinis conchyliis, & particula ligni putridi inhærente. Certum argumentum bonitatis gradum a diuturnitate elotionis, & mora in maritimis, fuisse affecutam.

Of Cobalt, and  
the Preparation  
of Smalt and  
Arsenick, by  
Dr. Krieg,  
n. 293. p. 1753

XVII. The *Cadmia* or *Cobalt* is a massy, grey, shining Stone, found in a great Quantity in the Mines about *Shneeberg*, and some other places of *Hermunduria*. 'Tis very often mixt with *Marchasite*, sometimes with *Silver* and *Copper Ore*; yea, the *Silver* is, but seldom, pure in the Figure of Hair. After they have pick'd out the *Cobalt*, and separated it from the common Stone, they beat it to Powder, by an Engine commonly us'd in Mines, call'd a *Pool-Work*. By that Operation, the Water carries away the light Stuff and Sand, leaving the heaviest behind. This Powder is afterwards put into a low and broad Furnace, made on purpose to separate the *Sulphur* and *Arsenick*; where the Powder is spread all over, and the Fire, which is beneath and behind it, is forced to pass its Flame along over the Powder, and so to take along with it the *Arsenick* in form of a Smoak, which afterwards is receiv'd by a low Chimney, and out of that carried in a close Channel made of Brick-Wall, of about 50 or more Paces, where the *Arsenick* by the way sticks to the Wall, in form of a white or yellowish Powder. The same is taken out every 6 Months and melted into whole pieces.

The *Cobalt* thus roasted, and smoaking little more, being red hot, is taken out, cooled again and gathered for melting. Its Colour by that way of roasting is turned a little more whitish. When they have a mind to melt it, the Powder of the *Cobalt* is mixed with Pot Ashes and Powder of white Flint Stones: The Proportion of them is according to the Goodness of the *Cobalt*, or as they will make the *Smalt* of a deep or paler colour: For Example, they take one part of Pot Ashes, two parts of *Cobalt*, and three or four parts of Flint. This Mixture is put into great strong Pots, standing in a hot Furnace; six or eight Pots in one Furnace; there it stands a melting for five or six hours time, turning into a blue Glass, which afterwards is taken out with a great Iron Spoon and put into a Vessel full of cold Water, where it cracketh and grows more tender, to be the more easily powdered again: But the empty Pot







Fig. 3.



Fig. 4.

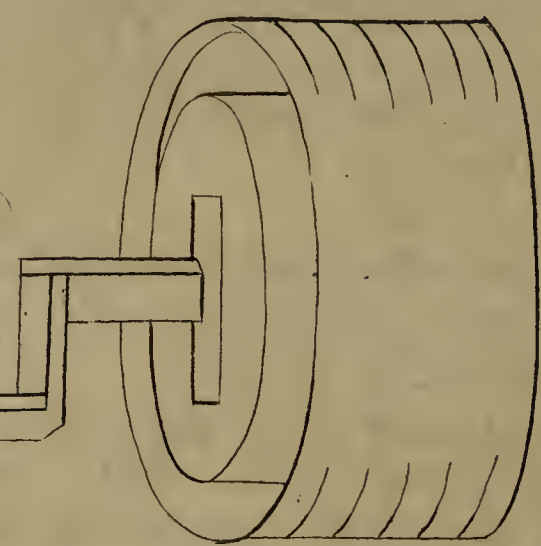


Fig. 1.

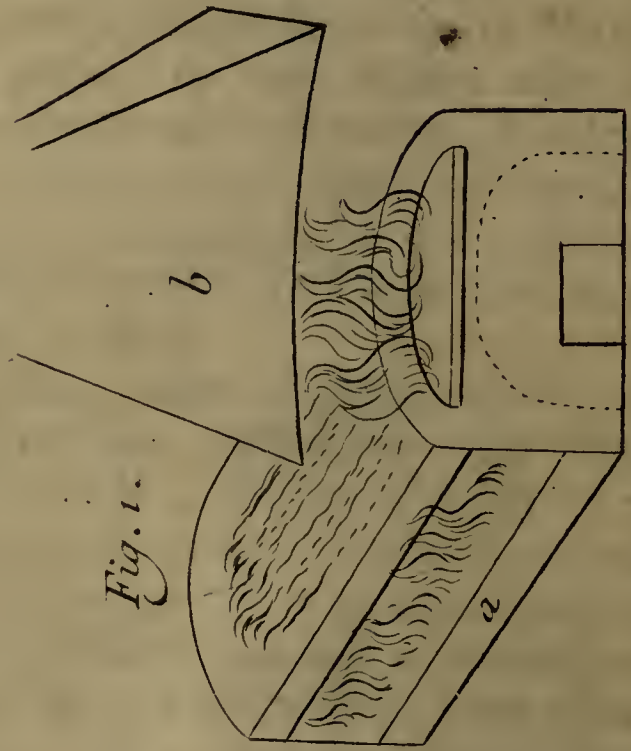
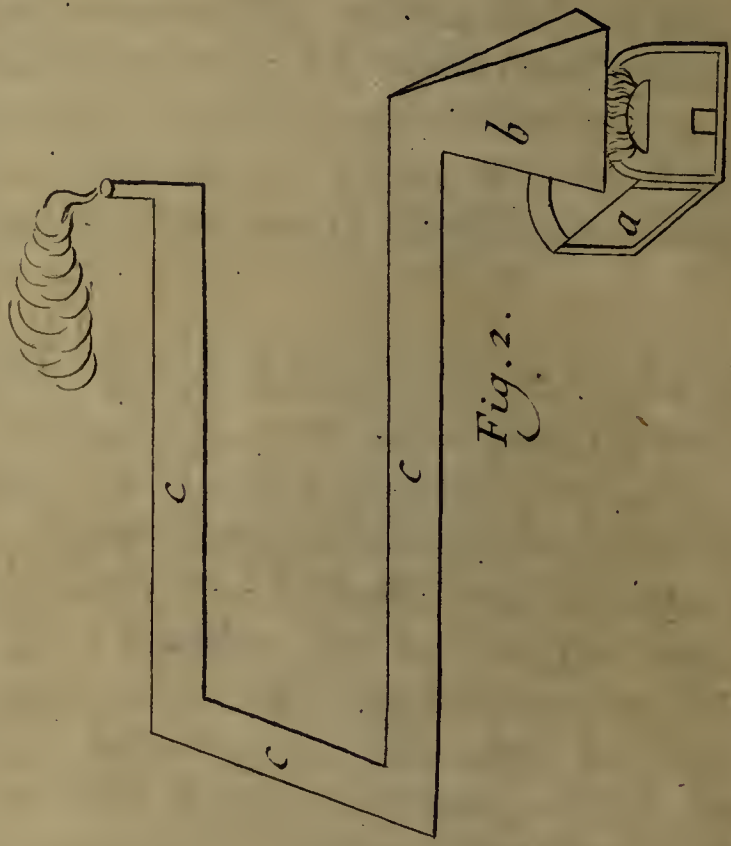


Fig. 2.





Pot in the Furnace is filled up again with the aforefaid mixture. And fo they continue Night and Day, not leaving off the Fire in the Furnace.

The blue Glafs taken out of the Water is powdered again by the ordinary Engine; the fineft, feperated by a Sieve, is put into a Mill, and grinded in Water into the fineft Powder, which by washing is ftill feperated from the Coarfer. It is afterwards dryed in little and warm Chambers, put into Barrels, and thus fent away to feveral Countries. If one of the Melting Pots breaks, or is very much burnt, fo that it muft be taken out, there they find always on the bottom two Cakes of different Stuff, not mixed with one another. The undermoft is a fort of *as Caldarium* or (*Gleiken Spiffe*) and the uppermoft is of *Marcafite*. The Grafs and Fruits growing thereabout, where fuch a Work-houfe ftands, is commonly poifoned by the Arfenical Smoak, that no Cattle or Men can without Damage feed upon them.

Fig. 1, 2. The Furnace where the Cobalt is roasted, and the Arfenick feperated. *a* The Furnace to roast the powder'd Cobalt. *b* The Chimney accepting the Arfenical Smoak. *c. c. c.* The Channel of Stones to collect the Arfenick. Explication of the Figures, Plate 9.

Fig. 3. The Furnace for melting the Cobalt into a Glafs, *a a a a* the holes where ftand the Melting Pots. The great holes, where they put in the Pots is fhut up with Bricks, and a little one left; where they take out the Glafs with the Spoon.

Fig. 4. Two Grinding Stones to grind in Water.

XVIII. The Levels of *Hatfield Chace*, being above 180,000 Acres of Land, were about half of them yearly drown'd and hurtfully furround- ed with an Ocean of Waters. *King Charles I.* Bargains, and fells to *Sir Cornelius Vermuyden*, a Dutchman, to difchace, drain and reduce them to conftant Arable and Pasture Ground, which to the Surprize of the whole Nation, and at the Charge of above 400,000 l. he at length happily effected. Subterraneous Trees in Hatfield Chace, by Mr. Dela Pryme, n. 2756. p. 980.

In the Soil of all, or moft of which the abovesaid 180000 Acres of Land, of which 90000 were drained, even in the bottom of the River of *Ouse*, in the bottom of the adventitious Soil of all *Marfbland*, and round about by the Skirts of the *Lincolnfbire* Woulds. unto *Gainsburg*, *Bantry*, *Doncafter*, *Baln*, *Snaith* and *Holden*, are found infinite Millions of the Roots and Bodies of Trees of all bigneffes great and little, and of moft of the forts this Island either formerly did, or at prefent does produce, as Pitch Trees commonly called Firrs, Oaks, Birch, Beech, Yew, Wirethorn, Willow, Afh, &c. the Roots of all, or moft of which ftand in the Soil in their natural Poftures, as thick as ever they could grow, as the Bodies of moft of them lye by their proper Roots. Moft of the great Trees, lie all their length about a Yard from their great Roots (unto which they did moft evidently belong, both by their Situation, and the Sameness of the Wood) with their tops commonly North East, though indeed the fmaller Trees lye almoft every way cros



cross those, some above, some under, a third part of all which are Pitch Trees, commonly called Firrs, some of which have been found of thirty Yards length and above, and have been fold to make Masts and Keels for Ships. Oaks have been found of 20, 30 and 35 Yards long, yet wanting many Yards at the small end. Some of which have been fold for 4, 8, 10 and 15 *l.* a piece. Which are as black as Ebony, and very lasting and durable in any Service that they are put unto. As for Ashes, it is commonly observed of them, that their Constituent parts and Texture are so dissolv'd, that they become as soft as Earth, and are commonly cut in pieces by the Workmens Spades, which as soon as flung up into the open Air, fall away into Dust; but all the rest, even the Willows themselves, which are softer than Ashes, preserve their Substance and Texture to this Day. I have seen some Pitch or Furr Trees, that as they have laid all along, after that they were fallen, have struck up great Branches from their Sides, which have grown unto the Thickness and Height of considerable Trees.

It is very observable, and manifestly evident, that many of those Trees of all sorts have been burnt, but especially the Pitch or Furr Trees, some quite through, and some all on a side; some have been found chopp'd and squared, some bored through, other some half riven with great wooden Wedges and Stones in them, and broken Ax-heads, somewhat like sacrificing Axes in shape, and all this in such places, and at such depths as could never be opened from the Destruction of this Forest, until the time of the Drainage. Near a great Root in the Parish of *Hatfield*, were found 8 or 9 Coins of some of the *Roman* Emperors, but exceedingly consumed and defaced with Time: and it is very observable, that upon the Confines of this low Country between *Burningham* and *Brumby* in *Lincolnshire*, are several great Hills of loose Sand, which as they are yearly worn and blown away with the Sand, are discovered under them many Roots of great Firrs or Pitch Trees, with the Impresses of the Ax as fresh upon them, as if they had but been cut down a few Weeks, which I have several times with pleasure taken notice of, as I have rid that way. Hazle Nuts and Acorns have frequently been found at the bottom of the Soil of those Levels and Mores, and Furr or Pitch, Tree Apples or Cones in great quantities by whole Bushels together. And at the very bottom of a new River or Drain, that the Drainers cut (almost 100 Yards wide, and 4 or 5 Miles long, at the Charge of above 30000 *l.* besides the great Sluice at the end thereof, which cost near 30000 *l.* more) were found old Trees squared and cut, Rails, Stoups, Bars, old Links of Chains, Horse-heads, an old Ax somewhat like a Battle Ax, two or three Coins of the Emperor *Vespasian*, one of which I have seen in the Hands of Mr. *Cornelius Lee* of *Hatfield*, with the Emperor's Head on the one side, and a Spread-Eagle on the other, but that which is more observable is, That the very ground at the bottom of the River was found in some Places to lye in Rigg and Fur, manifesting thereby that it had been plow'd and tilled in former Days.



A Friend told me, That about 50 Years ago, under a great Tree in this Parish was found an old shaped Knife, with a Haft of a very hard black sort of Wood, which had a Cap of Copper or Brass on the one end, and a Hoop of the same Metal on the other end, where the Blade went into it. He also found an Oak Tree within his Mores 40 Yards long, 4 Yards diametrically thick at the great end, 3 Yards and a Foot in the middle, and two Yards over at the small end, so that by moderate Computation, the Tree seems to have been as long again, for which he had 20*l.* proffered. At another time he found a Pitch or Fir-Tree 26 Yards long, besides the computed length thereof, which might well be 15 Yards more. So that there hath been exceeding great Trees in these Levels; that which is also very strange, is that about 50 Years ago, at the very bottom of a Turf-Pit, was found a Man lying at his length, with his Head upon his Arm, as in a common posture of sleep, whose Skin, being as it were tann'd by the More Water, preserved his shape intire, but within, his Flesh and most of his Bones were consumed and gone, an Arm of whom one of the Workmen cut off, and brought home. The like hath been observed in other Places and Countries, upon this very Subject of Subterraneous Trees.

Seeing we find Roots and Trees, with other things that are common to these Levels, not only there, but also in other \* Countries, the thing that yet remains to be enquired into is, How all this comes to be thus, and what Reasons and Causes can be given for the same. I conceive, that all those Trees grew in the very places where we now find them, both in this Country and all others where they are found. I never heard any Objections but two, of any note made against my said Opinion herein.

\* See Cambden's Britannia. Plot's Staffordshire, Leigh's Cheshire, &c.  
al.

The first always was, That *Cæsar* expressly says that no Fir-Trees in his time grew in *Britain*. This I do acknowledge to be true, and is so far from proving what it is brought for, that it is nothing at all to the purpose. For those Trees that are called Firs by the Vulgar (from their near Conformity and Likeness to that Tree) are well known by all learned Men (by the Redness, the resinous nature of the Wood, the Gracil Cones hanging downwards, &c.) to be the true Pitch-Tree, of which there are such great plenty in *Norway*, *Sweden*, and other Countries of the North, of which there are whole Woods of them at this very present in *Scotland*, and upon a Hill at *Wareton* in *Staffordshire* they grow wild to this very Day. In an old Deed relating to this very Chace, Fir-Trees or Bushes are mentioned as growing here and there one, about 300 Years ago; and it is very well known, that there was a Tree of the very same Wood growing upon *Hatfield* More side within this 30 Years, which a while after was cut down to make a Rail of, it being the very last of that kind that was seen flourishing here. The second was, That those sorts of Trees are so wedded to the high Mountains and Rocks, that they never thrive, nor naturally grow upon such low Grounds and Morasses, as these are where we now find them bury'd. But this I may



be bold to say is a great Mistake, for though they do indeed in all cold Countries of the North thrive best there upon the hardest Rocks and Mountains, yet are they sometimes seen even there plentiful and great, in the low Morasses of *Liefland*, *Courland*, *Pomerania*, and other Countries thereabouts; and in the low Forests and Woods West of *New England*, as I have heard many Travellers affirm; for the Truth is, That which these stately Trees chiefly delight to grow in, is a sandy Soil; and if it lie never so high, or never so low, there they will grow, and there it is natural to them. And as the Reverend and ingenious Mr. *Earat* Minister of *Hatfield*, lately observed in the digging of the Pit of a great Decoy in these Levels, the Roots of the Firs or Pitch-Trees always stood in the Sand, and the Oaks in the Clay; and I have observed the same in Multitudes of places of these Commons. So that the Soil is not at all unnatural to them, as some have foolishly imagin'd; and that they did all grow here there is no doubt to be made.

Thus as all those great and stately Trees flourish'd here, and compos'd one of the largest and most beautiful Forests in all the Country; so in the next place, I shall enquire how it came to be destroy'd, and for what Reasons and Causes it was so. All this may be known by searching into the ancient *Roman* Writers and Historians: who frequently tell us, that when their Armies and Generals pursued the wild *Britains*, that they always fled into the Fastnesses of Miry Woods and low watry Forests. *Cæsar* himself confesses the same, and says, That *Cassibelan* and his *Britains* after their Defeat passed the *Thames*, and fled into such low Morasses and Woods, that there was no Possibility of following them. We find also that the stout Nation of the *Silures* did the same when they were set upon by *Ostorius* and *Agricola*. The like did *Venutius* King of the *Brigantes*, who fled into the great woody Morasses of this Country, and perhaps into those very same that formerly overspread these Levels. And *Herodian* plainly tells us, That it was the Custom of the wild *Britains* to keep in the Fenny Bogs and thick marshy Woods, and when Opportunity offer'd to issue out and fall upon the *Romans*, who were at length so plagued with them, that they were forced to issue out Orders for the destroying and cutting down of all the Woods and Forests in *Britain*, especially of all those that grew upon Low Grounds and Morasses. That they were accordingly thereupon cut down, is evident in many Writers, who tell us, That when *Suetonius Paulinus* conquer'd *Anglesea*, he cut down all the Woods there. *Galen* the Physician tells us, That the *Romans* kept their Soldiers continually employed in cutting down of Woods, draining of Marshes and Fens, and in Paving of Bogs. It is manifest also, that they did not only do this themselves, but also impos'd the same heavy Task upon the Captive *Britains*, for *Galgacus* in his Speech to his Soldiers tells them, That the *Romans* made Slaves of them, and wore out their Bodies in cutting down of Woods and in cleansing of Bogs, amidst a thousand Stripes and Indignities: But that which is most observable, is what *Dion Cassius* tells us, to wit, That the Emperor *Severus* lost 50000  
of



of his Men in a few Years time, in cutting down of the Woods, and cleansing of the Fens and Morasses of the Nation. Now all that hath been alledged may I think sufficiently prove, That the *Romans* were the Destroyers of all those great Woods and Forrests, that we now find under ground in the bottoms of Mores and Bogs, and that they actually were in this part of the Country, and destroyed this great and beautiful one, of stately Firs or Pitch Trees, that overspread all those vast Levels, and the Country round about.

I come now more particularly to shew and prove, the common Road of the *Romans* out of the *South* into the *North*, was formerly from *Lindum* (*Lincoln*) to *Segelocum* [*Little burrow upon Trent*] and from thence to *Danum* [*Doncaster*, where they kept a standing Garrison of *Crispinian* Horse] a little off on the East and North East of their Road between the two last named Towns lay the Borders of the great Forest which swarmed with wild *Britains*, who were continually making their Sallies out of the same, and their Retreats into it again, intercepting their Provisions, taking and destroying their Carriages, killing their Allies and Passengers, and disturbing their Garrisons; which at length so enraged the *Romans*, that they were resolved to destroy it; and that they might do the same more effectually, as well as the more easily, they marched with a great Army against the same, and encamped upon a great Heath or More, not far from *Finningly*, (as by their Fortifications there yet to be seen is apparent) where it is probable that a great Battle ensued, for hard by is a little Town called *Osterfield*. Now as the latter part of the Word is never used to be added to any other, but where there hath been a Battle; so the former seems to tell us what *Roman* General it was that fought, to wit, the famous *Ostorius*, who, all the *Roman* Historians assure us, was in these Parts. But who got the Victory is not so easy to be judged of, though no doubt it was the valiant *Romans*, who, besides the Multitudes of the *Britains* that they slew, drove the rest back into the great Forest and Wood, that covered all this low Country. Whereupon the *Romans*, that they might both destroy it and the Enemy the easier, took the Opportunity of a strong South West Wind, and set great Fires therein, which taking hold of the Fir-Trees, burnt like Pitch, and consumed infinite numbers of them; then when the Fire had done what Mischief and Execution it could, the *Romans* brought their Army nearer, and with whole Legions of Captive *Britains* chopp'd and cut down most of the Trees, that were yet left standing, leaving only here and there some great ones untouched, as Monuments of their Fury, and un-needful of their Labour; which being destitute of the support of the Under-wood, and of their neighbouring Trees, were easily overturned by strong Winds. All which Trees falling cross the Rivers that formerly ran through this low Country, soon damm'd up the same, turned it into a great Lake, and gave Origin to the great Turf Mores that are here, by the Girations and Workings of the Waters, the Precipitation therefrom of terrestrial Matter, the Consumption and Putrifaction of



rotten Boughs and Branches, and the vast increase of thick Water Mofs, which wonderfully flourishes, and grows upon rotten Grounds. Which even now since the Drainage, and since that the Country is laid dry for many Miles round about, yet for all that, are so turgid with Water, and so soft and rotten, that they will scarce bear Men to walk upon.

Hence it is, that old *Roman* Coins, old *Roman* Ax-heads, &c. have been found by those Roots and Trees that lie at the bottom of these Mores and Levels. That in all these Grounds are found great numbers of Trees that are burnt, some in two, and some length ways, others hewn and chopp'd. That they lie by their own proper Roots with their tops North East. That some of the greatest Trees are found with their Roots on, and others as they have laid all along have had Branches growing out of their Sides, unto the Thickness and Height of considerable Trees: And that both the Clay and More Soil of the Country is in some Places two or three Yards higher than it was formerly, by the growing up of the same, and the daily Warp that the Rivers continually cast thereon, &c.

But to return, as the *Romans* were the Destroyers of this great Forest, so were they likewise of all those others that formerly grew upon the Low Countries of *Cheshire*, *Lancashire*, *Yorkshire*, *Lincolnshire*, *Staffordshire*, *Somersetshire*, &c. Yea, and of the very Countries which were beyond Sea, where such like Trees are commonly found. But as the *Romans* were not much in *Wales*, the *Isle of Man*, nor *Ireland*, so it cannot be supposed that it should be they that cut down their Woods; but tho' that they did not, yet others did, for *Hollinshead* and others of our Historians tell us, That *Edward* the First being not able to get near the *Welsh* to fight them, by their Continuance and Skulking in boggy Woods, commanded them all to be destroy'd and cut down by the Fire and Ax: and I doubt not at all but that the Roots and Trees mentioned by *Cambrensis* in *Pembrokeshire*, were the Relicts of some of those that were then destroy'd: And as for those in *Man* and other Islands, they have all been cut down in the time of War, and have laid till they were grown over with the Soil of the neighbouring Grounds: And as for those that are found in the Bogs of *Ireland*, many of our Historians expressly say, That *Henry* the Second, when he conquer'd it, cut down all the Woods that grew upon the Low Countries thereof, the better to secure his Conquest and Possession of the same, to keep the Country in a settled Peace, and to disarm the Enemy, who commonly trusting to such Advantages, are apt to Rebel; for safe Retreats are commonly observed to make not more Thieves than they do Rebels. I will only add, That it is a very common thing for Generals and Armies to this Day to destroy all the Woods that grow upon advantageous Places and Fastnesses in an Enemies Country, if they intend to keep the same; and that they always do it with the Fire and Ax.

Being at *Hatfield* the other Day, I was told by several Gentleman, that about 20 Years ago dyed one *Saunderson* of that Town, aged near  
80 Years,



80 Years, whose Father much of the same age, did frequently assure him, and other Gentlemen that were curious in the Matter, that he could very well remember many hundreds of great Fir-Trees, standing one here and another there, in a languishing decaying Condition, half as high as Houses, and some higher, whose tops were all dead, yet their Boughs and Brauches always green and flourishing, growing all of them in these Levels: And *John Hatfield*, Esq; who is not above 40 Years of age, has by him a large Twig that his Father pluck'd off from the Sprout of a green and flourishing Shrub of Fir that grew from the great Root of one of the same kind in these Commons. And an old Man of *Croul* tells me, That he has heard his Father say, that he could remember Multitudes of Shrubs and small Fir-Trees growing here while this Country was a Chace, and while the Vert was preserv'd, before the Drainage. And lastly, In many old Charters that I have seen of the pious *Roger de Mowbray*, Lord of *Axholm*, who liv'd in the Year \* 1390. \* *The Author observes afterwards, viz. n 277 p. 1077. that he liv'd in 1100. which makes the Relation more remarkable.* relating to *Hurst, Bellwood, Ross, Santoft, &c.* it appears that then all these places were cover'd with a great old decaying Forrest or Wood; and not them only, but also all that low Common between *Croul Causey* and *Anthrop upon Trent*; and tho' there be not one stick of any such thing now to be seen, yet it is not only plainly manifest that the same was true from the Roots there found, but also from the said Roots, that most of the Trees that grew there were Firs. All which were but the after-growth, and Relicts of the famous great Forest formerly described unto you, that was destroyed by the conquering *Romans*.

XIX. The Inundation at *Dagenham* in *Essex*, happened in 1707. by a Breach in the *Thames* Wall, at an extraordinary high Tide; and by means of the great Violence of the Water, a large Channel was torn up, or Passage for the Water of 100 Yards wide, and 20 Foot deep in some Places; and in some more, some less. By which means a great number of Trees were laid bare, that had been there interred many Ages before. The Trees were all, as far as I could perceive, of one sort, except only one, which was manifestly a large Oak, with the greatest part of its Bark on; and some of its Head and Roots. The rest of the Trees the Country People take to be *Yew*: And so did I myself imagine them to be, from the Hardness, Toughness, and weight of the Wood; but *D'Acre Barret*, Esq; convinced me they might probably be some other Wood, as *Alder*; which grows plentifully by our fresh Water Brooks. And lately he told me, He had the Opinion of an ingenious and good Judge of Wood, who takes it to be *Horn-beam*, which grows plentifully also with us in the higher Lands (but I do not remember to have seen it in watery Places near us) but I rather incline to the Opinion of its being *Alder*; the Grain of the Wood, and manner in which the Boughs grow, &c. much resembling that of *Alder*, more than *Horn-beam*. By lying so long under Ground, the Trees are become black and hard, and their Fibres are so tough, that one may as easily break a Wire of the same Size,



Size, as any of those Fibres. This Toughness they maintain, if the Wood be kept dry, as I find by two of the Trees I have now by me. But by drying, those Trees are become cracked, and very flawy within, but look sound outwardly, and with Difficulty yield to Wedges. But for the Trees lying in the Marshes, which are covered by every Flood, and laid bare by every Ebb, in a short time they become very rotten.

† In 1712.

There is no doubt but those Trees grew in the Place where they now lie, and that in vast Multitudes; they lying so thick upon, or near one another, that in many places I could step from one to another. And there is great reason to think, that not only the Marshes, which are † now over-flown (which are about 1000 Acres) are covered underneath with those Subterraneous Trees, but also all the Marshes along by the River side, for several Miles: For we discover these Trees all along the *Thames* side overagainst *Rainham*, *Wennington*, *Purfleet*, and other places: And in the Breach that happened at *West-Thorrock* about 21 Years ago, they were washed out in as great Numbers (as I have been informed) and of the same kind of Wood, as those found lately in *Dagenham* and *Havering Levels*.

These last mentioned Trees are of different Sizes; some above a Foot Diameter, some less. As I was rowed in a Boat along the Channel, I met with two of the lesser sort, standing upright, in the same posture in which they grew; their Tops just above Low-water, and their Bottoms (at least the bottom of the Channel) at 16 Feet depth. We endeavour'd to draw them out, but could not do it with all our Strength. They seemed to be about two Inches Diameter in their Trunk, had some of their Boughs on, were dead, and in all likelihood, being young and light, escaped the force of what threw the other more large, and unweildly ones down. Most of the Trees, that I met with, had their Roots on, and many of them their Boughs, and some a part of their Bark. There was only one that I perceived had any Signs of the Ax, and its Head had been lopped off.

As I passed the Channel which the Water had torn up, I could see all along the Shores vast Numbers of the *Stumps* of those Subterraneous Trees, remaining in the very same posture in which they grew, with their Roots running some down, some branching and spreading about in the Earth, as Trees growing in the Earth commonly are seen to do. Some of those Stumps I thought had signs of the Axe, and most of them were flat at top, as if cut off at the Surface of the Earth: But being rotten, and batter'd, I could not fully satisfy my self, whether the Trees had been cut, or broken off. The Soil, in which all those Trees grew, was a black ouzy Earth, full of the Roots of Reed; on the Surface of which ouzy Earth the Trees lay prostrate, and over them a Covering of grey Mould, of the self same colour and consistence with the dry Sediment or Mud, which the Water leaveth behind it at this Day. This Covering of grey Earth is about 7 or 8 Feet thick, in some places 12 Feet or more, in some less; at which depths the Trees generally lye.

The



The *Posture* in which they lay, was indeed in no kind of Order, but some this way, some that, and many of them acrofs: Only in one or two places I observ'd they lay more orderly, with their Heads for the most part towards the North, as if they had been blown down by a Southerly Wind, which exerts a pretty strong force upon that Shore.

As to the *Age* in which those Trees were interred, it is hard to determine. Many think they have lain in that subterrane State ever since *Noah's Flood*. But although I have not the least doubt but that at this Day we have many Remains of the Spoils of that Deluge, even in the highest Mountains, yet I rather think these Trees to be the Ruins of some later Age, occasioned by some extraordinary Inundations of the River of *Thames*, or by some Storms, which blow sharply upon this Shore: Either of which Acts of Violence might be able to root up, and tumble down Trees growing in so lax a Soil, as these manifestly grew in at that time. And as for extraordinary *Inundations* of the *Thames*, there is at this Day a Mark, which if occasioned by an Inundation, was the Mark of an Inundation very prodigious, beyond all ever known to have been in that River; and that is a *Bed of Shells*, if not of a kind of Marble too, lying cross the High-way on the Descent near *Stifford-bridge*, going from *S. Okendon*: Below this Bed of Shells, at above 50 or 60 Yards distance, in the bottom of the Valley, runneth a Brook, that empties it self into the *Thames* at *Purfleet*, about 3 Miles from thence; which Brook ebbeth and floweth as the *Thames* doth, but not at any certain height, by reason of Mills standing thereon; but above a pretty High-water in the Brook, the Surface of the Bed of Shells I find to lye above 20 Foot perpendicular. Consequently if this Bed of Shells was repositied in that place by an Inundation of the *Thames*, that Inundation must be such as would have drowned a vast deal of the adjacent Country, and have overtopped the Trees by the River, in *West-Thorrock*, *Dagenham*, and the other Marshes, and probably by that means over-turn them. This seems to me the most rational way of accounting for our Subterraneous Trees, and not by the *Universal Deluge*: For had they been left there by that Deluge, we should not find the bed of Earth, in which they grew, so entire and undisturb'd, as it manifestly is at this Day, a spongy, light, ouzey Soil, full of Reed-roots, as I said; and I assure my self (although I never try'd it) of much less Specifick Gravity than the *Stratum* above it is. Whereas I can affirm, that in three places where I have try'd it, the *Strata* are in a surprizing manner gradually specifically heavier and heavier, the lower and lower they lie.

Having given this Account of their *Prostration*, let us lastly enquire into the *Manner how these Trees came to be interred*. And this I take to be from the gradual increase of the Mud or Sediment, which every Tide of the *Thames* left behind it. I presume those Trees might be thrown down before the Walls or Banks were made, that keep the *Thames* out of the Marshes; and then those Trees were overflown every Tide. And by reason they lay thick, and near one another on the Ground, they

would



would soon gather a great deal of the Sediment, and be soon covered therewith, And after the *Thames*-Walls were made, every Breach in them, and Inundation would leave great quantities of Sediment behind it; as I by a troublesome Experiment found, in going over some of the Marshes, soon after the late Breach, where I found the Mud generally above my Shoes, and in many places above my Knees. And it is a practice among us (of which we have divers Instances) that where a Breach would cost more to stop, than the Lands overflown will countervail, there to leave the Lands to the Mercy of the *Thames*; which by gradually growing higher and higher, by the Additions of Sediment, will in time shut out the Water of the River, all except the highest Tides. And these Lands they call *Saltings*, when covered with Grass; or else they become *Reed-ground*, &c.

That it was the Sediment of the *Thames*, that buried those Trees, is farther manifest from what I said before, of the likeness of the Earth above them, in all respects, to the Sediment the River now lets fall, when dry; which may be observ'd to consist of many distinct Layers; some  $\frac{3}{4}$  of an Inch thick, some less, and some scarce  $\frac{1}{4}$  of an Inch. All which several Layers are, no doubt, the several quantities which every Tide left behind it. This Sediment, when dry'd by the Sun and Wind, becomes tough and hard, and looketh like a grey *Lapis Scissilis*, or *Slate*, divisible into many Plates or Layers. And what if we should ascribe the Conformation of *Slate*, *Muscovia-glass*, and other the like laminated Concretions, to a like Work of Nature, by adding new Layers of such Petrifications, and Particles, as the Fossile is made of?

I find that *Alder-Wood*, whether green or old, becomes blackish, much of the same colour as the Wood before mentioned in this Paper, in a Solution of Copperas. Which is not only an Argument, that the blackness of the Wood is owing to Vitriol, but also that the Wood is *Alder*, or some such like Wood, that will become black with Vitriol: For I am inform'd that all Subterraneous Wood is not black, particularly Firr. I have also try'd *Hornbeam* since, after the same manner, and find that also becomes black, as the *Alder* doth.

Of the Mosses  
in Scotland,  
by the Earl of  
Cromertie, n.  
330. p. 296.

XX. There are many Grounds in *Scotland*, which we call Mosses, whence the Country People dig Turf and Peat. The Scurf is cover'd with a heathy, and as they call it a heathery Scurf; and under the Scurf is a black, moist, spongy Earth; in some Places shallower, in others deeper; from 3 or 4 to 7 or 8 Foot deeper; and in some places, but not many, to twice or thrice the depth. They cut the heathy Scurf with a flat kind of Spade, which they force horizontally betwixt the Scurf and the foresaid spongy Earth; and so turn up the Scurf in flat thin Flakes, which they call Turfs. 'Tis readily over-run'd with the small Roots of Heath or Heather, and when dried makes a healthy brisk Fire; but with much Ashes, of a whitish, duskish or reddish colour; always the whiter as it contains the more of the woody Roots.

The



The black spongy Earth, which is under the Turf, they cut out in oblong Squares, with Iron-Spades made of that Shape, about 8 or 9 Inches long, and about 4 or 5 Inches broad: And as the Men cut them up, the Weaker Men, Women and Children, carry them in small Wheelbarrows, flattering them on some dry Ground, to be dried by Sun and Wind: Some become harder, some softer, according to the Nature of the Mould, or Earth; the more solid, the better Fire; and they are less esteemed, which are more spongy. And when they have cut off one Surface, of four or five Inches deep, they proceed downward to another; until at last, they come to the hard Channel, unless they be stopped by Water; which also they ordinarily remove by making a Channel to some Descent, if they can; and if they cannot, there the Water stagnates. And in such wasted Pits, where Water hinders to cut the spongy Earth to the bottom; the Pits will be filled up again, in a good number of Years, with new Ground, of spongy Earth; which in Progress of Time, will come to the Consistency of Peat-Moss, as at first, and a scurfy Heath Turf will at last grow on the top of it.

I have observ'd, That Peat-Pits, which have been digged since I remember, to have grown up again with new Peats; and that sometimes oftner than once, in the same Pits; some Mosses growing in shorter time than others. But I have observ'd also, That when they dig the Peats to the Channel, and in Places where the Water runs off, and doth not stagnate, that the Mosses did not grow, nor renew there again. Which moved me to order my Tenants, not to cut the Mosses to the Channel, nor in very large Openings; but rather in smaller Pits, that they may grow again more hastily: And the Event hath answer'd my Design. But within these few Days, Sir Robert Adaire, (a most Ingenious Gentleman) told me, That without cutting the Mosses, in the Method of Pits; but by cutting in fully to the Channel, and by laying the heathy Turf, which is cut off the top of the Moss; he said, by laying it on the Channel, so as to cover the Channel over, that in Progress of Time a Moss would grow there again; but not so hastily as in the Pits. I never observed any of these Mosses, which did not stand on Plains: Albeit the heathy, or heathry Turf, do over-spread the Faces and Declivities of the Scots Mountains, for the most part; there are many Mosses, which stand very high on these Hills; yea, sometimes not very far from the top. But the Peat Mosses are always in a Plain, though there be Descents to them, and Descents from them; yet I never observed them to stand on such a Plain, as the Water might stagnate on: And they always have a Descent to them, from some higher Grounds, whereby Water did descend to that Plain; which I take to be the Parent of Peat. Thus much of the Mosses in general.

In many of these Mosses, there is found quantities of Firr and Oak Wood; for, as I said, I never observed nor heard of other Woods in them. These are ordinarily found in whole Trees; but the smaller Branches are seldom found unconsumed. I have seen very many, and



very great Trees of both kinds: But generally speaking, the Oak is always black; the Firr sometimes whiter, sometimes redder, as is observ'd in all Firr Woods: But neither Firr nor Oak are found with any Bark upon them. The Firr is generally as fresh and tough, and as fit for any Use, as any other old Wood is: Only the Wood of these found in Mosses, has so imbibed the Water, that it takes a long time to dry, and fit it for Use, especially the Oak; insomuch, that when it is put into any small Work, it readily warps and changes its Figure. We never find any of the Oaks standing in the Woods have that Blackness; so that I presume, the Blackness accrues from the Water.

There are many Places, where Woods do not now grow; albeit, People endeavour to cultivate them; and yet the Mosses in these Places are well stored with this kind of under-ground Timber, both Oak and Firr, but especially Firr; such are *Orkney*, the *Lewes* (which are Isles,) *Cathness*, *Tarbartness*, and the Coast of *Buchan*. But yet it would appear, that there have been Woods of old in these Places, or how else could they come to these Mosses: And for a farther Proof of this Inference, be pleased to take Notice of the following Account.

In the Year 1651: I being then about 19 Years old, and occasionally in the Parish of *Lochbrun*, passing from a Place called *Achadisfield*, to *Gonnard*, I went by a very high Hill, which did rise in a constant Steepness from the Sea; only in less than half a Mile up from the Sea, there is a Plain about half a Mile round; and from thence the Hill rises in a constant Steepness, for more than a Mile in Ascent. This little Plain was at that time all covered over with a firm standing Wood; which was so very old, that not only the Trees had no green Leaves, but the Bark was totally thrown off; which the old Countrymen, who were in my Company, told me, was the universal manner in which Firr Woods did terminate; and that in 20, or 30 Years after, the Trees would ordinarily cast themselves up from the Root; and that they would lie in heaps, till the People would cut them, and carry them away. They likewise did let me see, that the outside of these standing white Trees, and for the space of one Inch inward, was dead white Timber; but what was within that, was good solid Timber, even to the very Pith, and as full of Rozin as it could stand in the Wood.

Some fifteen Years after, or thereabouts, I had occasion to come the same way; and call'd to mind the old Woods which I had seen. Then there was not so much as a Tree; or appearance of the Root of any; but in place thereof, the whole Bounds, where the Wood had stood, was all over a plain green Ground, covered with a plain green Moss. I asked the Country-People, who were with me, what became of the Wood, and who carried it away? They told me, no body was at the Pains to carry it away; but that it being all over-turn'd from the Roots by Winds, the Trees did lie so thick and swarving over one another, that the green Moss (there, in the *British* Language called *Fog*) had over-grown the whole



whole Timber; which they said, was occasioned by the moisture that came down from the high Hill, which was above it, and did stagnate upon that Plain; and they said none could pass over it, because the Scurf of the Fog would not support them. I would needs try it; and accordingly I fell in to the Arm-Pits, but was immediately pulled up by them. Before 1699. that whole piece of Ground was turn'd into a common Moss; where the Country-People are digging Turf and Peats, and continue so to do. The Peats as yet are not of the best, and are soft and springy, but grow better and better; and as I am inform'd, it does now afford good Peats. This Matter of Fact did discover the Generation of Mosses; and whence it is, that many Mosses are furnish'd with such Timber.

These Highland Woods are ordinarily stored with other kind of Timber, as Birch, Alder, Ash, besides Shrubs, and Thorns; yet we never find any of those Woods remaining in the Mosses. Whilst I speak of Mosses, allow me to add this, (*viz.*) That in a Moss near the Town of *Elgin* in *Murray*, though there be no River or Water that runs into the Moss, yet three or four Foot in the Moss, there is a sort of little Shell-Fish resembling Oysters, found numerously in the very body of the Peats, and the Fish alive within them; though no such Fish be found in any Water near to that Moss, nor in any adjacent River; no, nor in the stagnating Pits, that are in that Moss; but only in the very substance of the Turf: Some of which were sent to me from the place, a little before I came from *Scotland*.

XXI. I have seen many such in the North of *Ireland*, and know your Lordship's Account of them to be very exact and true. I have likewise been an Eye-witness there, that when the Turf diggers have come to the bottom, or firm Ground, by having dug out all the Earth proper to make Turf or Peat, and come to the Clay or other Soil by draining off the Water, that then there have appeared Roots of Firr Trees, with their Stumps standing a Foot or two strait upright, and their Branches spread out on every side horizontally on that firm Surface; as if that had been formerly the outward Face of the Ground, and place of their Growth. And I remember to have observ'd these Roots to be sometimes so near one another, as that their Branches were as it were matted, grew over, and gave place to one another, as we every day see in Roots of Trees where they grow too close. I saw once the body of a Firr Tree dug up so big, as to be judg'd fit for the main Post of a Wind-Mill; which was discover'd, as many of them which are not found in digging Turf are, by the Grass which grew over it being in a very dry Summer of a yellowish colour.

The Reverend Mr. *de la Pryme* sent me some of the Cones found with this Timber in the great Fenns of *Lincolnshire*, which differed in nothing from those of the *Scotch* Firr, which your Lordship has so plentifully growing in *Scotland* at this Day, and which some Years since were



judged so proper by some to afford Masts for the Navy Royal, that I think some Persons were sent thither for that purpose. But they were not able to bring about what they intended, by reason of the Difficulties in the Roads by which they were to be conveyed to the Sea; which in *Norway* I have heard is in a great measure effected by the Rivers. *Cæsar*, indeed, in his Commentaries says, That the sorts of Timber in this Island are the same as in *France*, *præter fagum & abietem*, except Beach and Firr. Your Lordship is a sufficient Witness of his Mistake as to one sort of these Trees, and the Beaches in the *Chiltern* Countries near *London*, prove the same as to the other. For the Uses of this underground Timber, besides those of other Wood, it is split into pieces; and being lighted, supplies the use of Candles. It is also made into Ropes; as may be seen in the *Musæum* of the Royal Society, by a long piece of such Rope, bought by the Honourable *Edward Southwell*, Esq; in *Newry* Market in *Ireland*, and presented by him to the Royal Society; the long soaking in Water having render'd the Wood of those Trees fit to be made into Ropes. This seems to prove, that as the soaking of Hemp, Flax, Aloe Leaves, &c. in Water, dissolves the pulpy part, and leaves the fibrous fit for making into Threads and Ropes, so the long soaking of Trees may make in length of time the same, or an analogous change in those of Wood and Timber. I have seen what I thought had been pieces of Wood, not only in Clay Pits, but even in Quarries or Stone Pits, in the Blocks of Stone raised out of their *Strata*, or Layers; and have been assured by Mr. *Bellers*, he hath seen large pieces of Wood in the Stone Pits in *Gloucestershire*; and also that in *Lancashire* there is a Moss, or Turf Bog, where the black spongy Mould, made use of for Peats, smells very strong of *Bitumen*, or *Petroleum*; of the Oil of which it yields a very great quantity by Distillation. And the late Sir *Edward Hannes* told me, that near the Lord *Blessington's* House at *Blessington* in *Ireland*, there appeared a Light where the Horses trampled with their Feet on a certain space of soft Ground. On my desire he procured me some of this Mould, which I have yet by me, and which agrees exactly in its dark colour, lightness, &c. with Peat Earth. And on Examination of this by a Microscope, I found the light proceeded from many small half transparent whitish live Worms, which lay in it.

The blackness of the Oak, which your Lordship mentions, comes, in my opinion, from the Vitriolic Juices of the Earth soak'd into the Oak, which being astringent is turned black by them. Your Lordship knows that Ink is made of Galls, an astringent Excrecence of a sort of Oak in *Turkey*, made by an Insect there; and of green Vitriol, which is made of the Pyrites dissolv'd by Rain Water, and Iron. Earth of all sorts, and even human Calculi, and the Ashes of Vegetables, have in them Particles of Iron, in greater or lesser quantities. The Pyrites is also very common. The Particles of Iron coming to be dissolv'd by this Pyrites, Subacid, or other Salts dissolv'd by Water, or perhaps by Water



it self, and carried into these Bogs, there fastens to the Tree, soaks into it, and turns it black.

These Particles in some River Water, fastening to the Oak Timber floated in it, give the same a darkish colour; taken notice of by Mr. *Pepys* in his Naval Memoirs of *England*, p. 71. where we are told by the most famous Ship-Builders of *England*, "That the best Foreign Plank for the Royal Navy was brought either from *Dantzick*, *Quinborow*, (that is *Koningsberg*), or *Riga*, of the Growth of *Poland* and *Prussia*, or from *Hamburg*; namely, that sort thereof which is shipp'd from thence of the Growth of *Bohemia*, distinguish'd by its Colour, as being much more black than the other, and rendred so (as is said) by its long sopping in the Water during its Passage thither."

In the Turf Bogs of *Ireland* 14 Foot deep, are found not only the Mouse-Deers-Horns, mentioned \* in one of these Transactions, but likewise their whole Skeletons, wherein the Bones bear the same proportion to the like Bones of other Deer, as the Horns bear to their Horns. There are also found therein Gold Chains, Pieces of Money, and Roots of Heath, several *mossi*, and Branches of Trees so soft, as to give no resistance to the Turf Spade: And I was told; That in cutting Turf in one, they at several Feet deep cut through what the *Irish* call a Ruskin of Butter (which was a Firkin or Vessel, made of the Barks of Trees, used by the old *Irish* for putting up their Butter.) And I remember, that in digging the wet Dock at *Deptford*, there were found at the bottom, about nine Foot deep, Grass Leaves, Hazle Nuts, and Roots of Trees: And there also was found a piece of Money, as they call'd it; which was sent me by Mrs. *Willoughby*, and it prov'd to be a Leaden Seal to some Bull of Pope *Gregory* the IX. who continued Pope from the Year 1227 to 1241. \* *Abr. Vol. II. p. 432.*

There are several Passages in *Lelands Itinerary* Vol. V. † which have a near relation to these Matters, and shew the common Opinion in his Days of the cause of the Destruction of Woods, the growing of Mosses and Pools; and that, at that time, in *Wales*, the Sense of the Inhabitants was, that the under-ground Trees found there had formerly grown there. † *p. 13. p. 67. p. 63. p. 75. p. 79. p. 81.*

#### XXII. Papers Omitted.

1. A Description of some Shells brought from the *Molucca* Islands, by Mr. *Sylvanus Landon*, and Mr. *Rowleston Jacobs*. By Mr. *James Petiver*, R. S. S. n. 274. p. 927.

2. A Description of some Corals, and other Submarines lately sent by the Reverend *George Joseph Camelli*, from the *Philippine* Isles. By Mr. *James Petiver*. n. 286. p. 149.

3. Catalogus Concharum, Fossilium, Metallorum, Mineralium, &c. quæ a Cl. D. *Johanne Jacobo Scheuchzero* M. D. *Tiguri*, & R. S. S. nuper accepit D. *Jacobus Petiver*. n. 301. p. 2042.

4. Mineralia quædam, Conchyliâ petrificata, & alia Fossilia e *Berolina* a Cl. *Christian. Maximiliano Spenero*, Doct. Med. Reg. Pruss. Aul. Acad. n. 302. p. 2032.



Acad. S. R. J. Cur. & Soc. Scient. Reg. Brandenbug. Colleg. ad Amicum suum curiosissimum, D. Jacobum Petiver, Pharmacop. Londin. & R. S. S. missa.

- n. 311. p. 2397. 5. De Conchyliis Turbinatis, Bivalvibus & Univalvibus, item de Mineralibus, Fossilibus & Thermis Philipponsibus, ex MS. R. P. G. F. Camel. Communicavit Jac. Petiver.
- n. 314. p. 77. 6. An Advertisement of several Specimens of figured Fossils, which may be had of Mr. Alban Thomas.
- n. 337. p. 222. 7. A short Account of some Swedish Minerals sent by Mr. Angestein, Overseer of the King of Sweden's Mines, to Mr. James Petiver.

## XXII. Account of a Book Omitted,

- n. 291. p. 1604. Specimen Lithographiæ Helveticæ, quo Lapides ex Figuratis Helveticis selectissimi Ære incisi sistuntur & describuntur, a Joh. Jac. Scheuchzero, M. D. Tiguri, 1720. 8vo.

## C H A P. IV.

### Magneticks.

**H**AVING touched a piece of Wire, so that it strongly tended N. and S. I was minded to see whether it would have any Inclination to either of the Poles of the World, when turned round like a Ring, so that the two ends of the Wire met. And having again straitned it, I was surprized to find it had quite lost its *Verticity*. The cause of which I presently concluded to be the Contact of the Northern and Southern ends of the Wire, which I thought might so influence one the other, as to confuse its Poles; although I confess I had never observed any such Confusion to arise upon the bare contact of the Northern and Southern ends of two other touched pieces of Wire. Upon this I touched strongly the same, and other pieces of fresh Iron Wire, and having found them all greedily to turn N. and S. I coyled them round so as that the ends should not come near one another, and again speedily opened them strait; and found as before, that every piece had utterly lost its *Verticity*: Nay, the *Magnetick Virtue* was so absolutely destroyed by bending the Wire, that it had not only lost its Inclination to either Pole, but the two ends of each Wire seemed indifferent to the Poles of the *Load-stone*, viz. whereas before the bending, the adverse Poles of the *Loadstone* would repel, and the Similar Poles attract the adverse, or Similar ends of the Wire: Now the repulsive Virtue was quite extinguished, and either end would indifferently be attracted by either Pole of the Magnet; all one as if the Wire had been heated red hot (which is well known to destroy the Virtue) or never had been touched at all.

This



This I experimented over and over again upon Wires of different lengths, with the same Success. Only this must be observed, if you only bend the Wire round, so as that it shall spring back into its place, or recoil, so as to be near the same Straitness, that then no such, or but little of such Effect, will ensue. But to produce this Effect, the Wire must be *sharply* bent, so as that *violence* may be exerted upon it. If it be coyled two or three times round a small round Stick, it will best succeed. And farther also, it is necessary that every part of the Wire should be bent, to evacuate the Magnetick Virtue: For if the ends, or any other part happen not to suffer the violence of bending, that part shall retain its Magnetism. As for instance, if the Wire be all coyled, except half an Inch, or indeed half a tenth of an Inch at each end, every part so coyled shall both lose its Verticity, and shall incline indifferently to either Pole of the Magnet; but the two ends, (although not able to turn the whole Wire N. and S.) shall fly from, or tend unto the respective Pole of the Magnet: Or if every part of the Wire be coyled, except a small bit at one end only, all that coyled part, when extended, shall utterly be deprived of its Magnetism as before; and only that uncoyled bit retain its Aversion or Inclination to the Magnetick Poles. From the Consideration of all which Particulars, it is manifest, that the violence exerted upon the Wire by bending doth utterly extirpate the Magnetick Virtue, or at least make such a Confusion therein, that it is as if wholly destroyed. But the Experiment not succeeding in some Tryals since, I have had reason to fear the Society might call my Integrity in Question. p. 2138.

The matter of Fact was thus, and to me surprizing: I touched and coyled several Iron Wires, but the Effect that ensued was not such as I told the Society. The Verticity was indeed much weakned, but not totally destroyed, and the ends of the Wires would be attracted or repelled by the Poles of the Magnet; whereas I said they used only to be attracted. The next Morning I tryed again: And then the Magnetism of the Wires was totally destroyed, as I before related. This Experiment I repeated divers times, and on divers Wires this Winter, and commonly find, that all the Day, coyling will evacuate the Magnetism: But that it will not absolutely do it in the Evenings. But whether it will do so in Summer, or all Weathers, or whether it succeedeth thus only in different times of the Day, I must leave to farther Tryals. I well know that the Orb of the Activity of Magnets is larger, or less, at different times. That noble Magnet in the Society's Repository found in *Devonshire* by Dr. Cotton, is known in some Weathers (or at some times) to keep a Key, or other piece of Iron, suspended to another Iron at 8, 9 or 10 Foot distance. But at other times, the Iron will drop down at the distance of 3 or 4 Foot from the Magnet. If I lived nearer, I would observe the *Phænomenon* more nicely: Particularly whether there be any difference therein in the Evening, and the rest of the Day.



Finding the Case thus with *Coyled*, or *bent Wire*, I was minded to try the Event of *Twisting* of Iron Wire from end to end, after it had been well touched. The Success was, The *Verticity* was always weakened, and sometimes inverted. And when it was so, the Load-stone did accordingly commonly Repel or Attract, all one as if the twisting the Wire had given a new Touch the contrary way. But in some Wires so twisted, the *Verticity* was wholly destroyed, or rather much confused. For I found by drawing one of the Poles of the Loadstone along near the sides of the Wire, that in some places it would Attract, in others Repel, and so attract and repel all along the Wire. Nay, I fancied in some places, that one side of the Wire would be attracted, the other repelled by one and the same Pole of the Loadstone. To these odd Changes, I could add divers others, which the *Twisting* produced. But these do sufficiently shew that the Magnetick Virtue is put into great Confusion by the Violence exerted upon the Wire by *Twisting*: Which not only separateth the Fibres of the Iron (as may be seen with the Eye, especially assisted with a Microscope) but also changeth their Situation from Longways to Skrew-ways.

In *Cleft Wires* the Case is very uncouth. Oftentimes the Poles are quite changed; so that what was the *North*, becometh the *South* Pole of the Wire in all respects; I mean, not only turning, but also embracing, or avoiding the Poles of the Loadstone, as if it had received a new, and contrary Touch. Sometimes one half of the Wire will retain its Magnetism, which it had before splitting, and the other half have it quite changed. Sometimes no change at all will ensue, only the Magnetism be much weakned; as indeed it always is in all the Experiments where the Wire is split. (But generally, where one of the halves hath suffered change, the other not, I have observed, That 'tis the thinnest and weakest that hath been changed, and the thickest hath retained its Touch.) Sometimes where one of the split Halves receiveth an *inverted Verticity*, or seemeth to have no *Verticity* at all, one of its Ends will incline to one of the Poles of the Magnet, not according to its Touch, but in an inverted Order, and the other end be attracted indifferently by both the Poles of the Loadstone. And in some Cases, that End shall be attracted by one Pole, but be neither attracted nor repelled by the other; but stand as it were hesitating whether it had best fly to, or from that Pole of the Loadstone. Only if that Pole of the Magnet be too near, then that end of the Wire will constantly fly thereto: As indeed it is the nature of all Magnets and Magnetick Bodies to do, when they touch, or approach very near one another, though they repelled before.

There is one thing very surprizing, which will deserve to be mention'd, viz. That the *laying one*, or the *other side Half uppermost*, will cause a great Alteration in its Tendency, or Aversion to the Poles of the Magnet (as I have said.) But if you lay the contrary side of that half upper-



per-moſt, the ſame end ſhall be attracted by one, and repelled by the other Pole of the Magnet. In other pieces, where the ends are regularly attracted or repelled, only in an inverted order (as if new touched,) if it lay with the round ſide uppermoſt at that time, and be then turn'd upſide down, *viz.* the flat cleft ſide uppermoſt, 'tis ten to one if one of the Ends be not either attracted by both the Poles, or repelled by both; or elſe attracted or repelled by one, and heſitates as to the other: For ſo it often befalls. The Cauſe of this lubricity of the Magnetiſm I imagined might be, becauſe the ſides or edges of the Wire had received contrary Poles by ſplitting: And conſequently were turned topſy-turvy, that what was the N. might then be the S. edge of the half. But I could never diſcover, but that the ſides of each end, or of any other part, were the ſame, when I held the Loadſtone to one or the other ſide. Which indeed I always did in every Experiment for greater certainty ſake.

I was minded to repeat the old Experiment of touching Wires, *by rubbing them backwards and forwards* with one of the Poles of the Loadſtone, becauſe it might probably give ſome Light into the afore-mentioned ſtrange *Phænomena*. This I tryed, and found what is ſaid, not only to be true, but alſo that the Reaſon thereof is, *Be cauſe the Poles of the Wire or Needle, ſo touched, are not at the ends, but in, or near the middle of the Wire or Needle.* Sometimes one is near the Center, the other at one or both ends. For in ſome Wires ſo touched, both the ends of the Wire would be attracted by one Pole of the Loadſtone, and repelled by the other. And in ſuch Caſe the repelling Pole always found a Sympathetick part near the Center of the Wire. In others (eſpecially where a Verticity ſucceeded, as ſometimes it will do, and that pretty ſtrongly too, in ſuch a Caſe) the Verticity would be inverted, and the ends of the Wire be attracted and repelled in a direct contrary manner to the natural Form. And the reaſon of all this will be manifeſt from theſe following Experiments.

I touched a Wire from end to end with only one Pole of the Magnet. This gave ſo vigorous a touch, that I am almoſt of opinion, *It is the beſt way of touching.* The Conſequence was, the end where I began always turned contrary to the Pole that touched it. I again touched the ſame Wire, and others too with the other Pole of the Magnet, from the ſame end, and then that end turned the contrary way. *e. g.* Mark one end of a Wire for the North-end, and touch that Wire, by drawing the N. Pole of the Magnet divers times along the Wire from the N. to the S. end: This Wire ſo touched ſhall have a vigorous Verticity; but the North-end ſhall ſtand South. But if you touch that or another Wire, (for it is all one, becauſe the latter deſtroys the former Touch; I ſay, if you touch) by drawing the N. Pole of the Magnet from the S. to the N. end of the Wire, then this N. end will turn N. And ſo it will do the ſame, if you touch with the Southern Pole from the N. to the S.



There is one Experiment more doth yet give farther light into what goeth before, *viz.* I touched an Iron Wire exactly in the middle with only one Pole of the Loadstone, without drawing it backwards or forwards. The Event was, That in that place that Pole of the Wire was, and the two Ends were the contrary Pole of the Wire; and were accordingly repelled or attracted by the Poles of the Loadstone: And the middle, and an Inch or more on each side was attracted by the Pole only that touched it.

*An Experiment of Magnetical Attraction, by Dr. Taylor, n. 344.p. 294.* II. Mr. *Hawskbee* and my self in 1712. made an Experiment with the great Loadstone belonging to the *Royal Society*, in order to discover the Law of Magnetical Attraction. On comparing the Numbers of this Experiment with that made since by Mr. *Hawskbee*, and publish'd in the *Phil. Trans.* No. 335. I find the Numbers of the former very much more regular; wherefore I conclude that to be the best Experiment, and since I have reason to believe Mr. *Hawskbee* lost the Table I left with him for the Society, of the Numbers relating to it, I take leave here to give an Account of it.

We plac'd the great Loadstone belonging to the *Royal Society*, so that its two Poles lay in the Plane of the Horizon; and were in a Line exactly at right Angles with the natural Direction of the Needle we made use of (which was that Dr. *Halley* had made to observe the Variations with;) and by means of a Carriage contriv'd for that purpose, the Stone was easily mov'd to and fro, the Poles continuing always in the same Line. The Needle was so plac'd, that the Center it play'd upon was in the same Line with the Poles of the Stone; the North Pole being towards the Needle. We measur'd the Distances from the Center of the Needle to the Extremity of the Stone; and found the Variations of the Needle from its natural Position, to be as in the following Table.

Distant. Feet.	Variation. ° ' "	Distant. Feet.	Variation. ° ' "	Distant Feet.	Variation. ° ' "
1	81 45	4	16 00	7	3 30
2	58 00	5	9 20	8	2 20
3	30 00	6	5 35	9	1 35

*A Defence of Dr Halley's Map of Variations, n. 341. p. 165.*

III. It must be acknowledged that the Gentlemen of the *Royal Academy of Sciences* in *France*, have for some Years past, apply'd themselves with much Candour, as well as Diligence, to examine the Chart I publish'd in the Year 1701, for shewing at one View the Variations of the Magnetical Compass, in all those Seas with which the *English* Navigators are acquainted: And to my no small Satisfaction, I find that what I did so long ago, has been since abundantly verified by the concurrent Reports of the *French* Pilots, who of late have had frequent Opportunities



nities of enquiring into the Truth thereof. So that I am in hopes I have laid a sure Foundation for the future Discovery of an Invention, that will be of wonderful use to Mankind when perfected; I mean that of the Law or Rule by which the said Variations change, in Appearance regularly, all the World over. Of this I have adventured long since to give my Thoughts in \* N<sup>o</sup>. 148. and 195. of these *Transactions*, and as yet I see no Cause to rerract what I there offer for a Reason of this Change; but of this we might be more certain, had we a good Collection of Observations made in that Ocean, which divides *Asia* and *America*, and occupies about two fifths of the whole Circumference of the Globe. This we hope, from the natural Curiosity of the *French* (who want no Means of performing it) may be effectually supply'd by such of that Nation who may return from *Peru* by the *East-Indies*.

\* *Abr. Vol. II.*  
p. 610. and  
p. 615.

In the mean time I cannot omit to take Notice of two Particulars, seeming to call in Question the Truth of my aforesaid Map, which I have lately observed in the *Memoirs* of the *Royal Academy of Sciences*.

The one is in the *Memoirs* of the Year 1700, concerning the Variation observed at *Paraiba* in *Brasil*, about 25 Leagues to the Northwards of *Pernambouc*, by M. Couplet le fils, whose Words are these,

*Le 20 Mai, 1698. ayant auparavant tracé soigneusement une ligne Meridienne, dont je m'étois servi pour les Observations Astronomiques, j'observai la déclinaison de l'aiguille aimantée de 5° 35' Nordouest.* And the same Observer tells, That he found the Latitude of the Town of *Paraiba* 6° 38' 18". Now it so fell out, that my self was in the River of *Paraiba*, in the Month of *March*, 1699. and there fitted and cleaned my Ship, so that I had full Opportunity to observe the Variation both on Board and on Shore, and found it constantly to be above 4 Gr. *North-East*; so that I am willing to believe this to be an Error of the Press, putting N. W. for N. E; or rather of the Memory of M. Couplet, who it seems, lost all his Papers by Shipwreck in his Return. The like may be said of the Latitude of *Paraiba*, which, though I did not observe my self, yet at the Fort of *Cabo Dello*, at the Mouth of the River, and which is about 3 Leagues more Northerly than the Town, I found the Latitude not less than 6° 55' South, and by Consequence that of the Town more than 7 Degrees.

The other is in a Discourse of M. de Lisle, in the *Memoirs* of 1710; where he compares the Variations observed in some late Voyages, with my Map of the Variations. Among other Things, 'tis there said, that on the East-side of the Island *St. Thomas*, under the Equinoctial Line, Mr. *Bigot de la Canté*, second Lieutenant of the King's Ship *la Sphere*, had in the beginning of the Year 1708. found the Variation 11½ Gr. whereas my Chart makes it but 5½ Gr. 'Tis true, that I never observed my self in those Parts; and 'tis from the Accounts of others, and the Analogy of the whole, that in such Cases I was forc'd to supply what was wanting; and 'tis possible that there may be more Variation on that Coast than I have allowed. But consulting my Chart (which was fitted



to the Year 1700.) I find I then make the Variation at the Isle of Saint Thomas full  $7\frac{1}{2}$  Gr. and not  $5\frac{1}{2}$  Gr. the which, by the Year 1708. might well arise to near 9 Gr. So that the Difference will become very tolerable; whereas an Error of 6 Degrees, such as is here represented, would render the Credit of my Chart justly suspected, and the same by consequence wholly useless, as not to be confided in.

But a further Thing I might complain of is, That in the same *Memoire* of M. de Lisle, the Geography of my Chart is called in Question; and we are told that I have placed the Entrance of the *Magellan* Straights at least 10 Degrees more Westerly than I ought to have done: for that the Ship *St. Louis*, in the Year 1708. sailing from the Mouth of *Rio Gallega*, in about the Latitude of 52 Gr. South, and not far from Cape *Virgin*, directly for Cape *Bonne Esperance* (which Course perhaps was never run before) had found the Distance between the two Lands not more than 1350 Leagues, which he concludes, is much less than my Chart of the Variation makes it. I know not from what Computation M. de Lisle has deduced this Consequence, but I find by my Chart that I have made the Longitude of *Rio Gallega* 75 Gr. West from *London*, and that of Cape *Bonne Esperance*  $16\frac{1}{2}$  East from it; that is in all  $91\frac{1}{2}$  Gr. difference of Longitude. This, with the two Latitudes, gives the Distance, according to the Rhumb-line 1364 Leagues, but according to the Arch of a great Circle, no more than 1287 Leagues; so that instead of invalidating what I have there laid down, it does absolutely confirm it, as far as the Authority of one single Ship's Journals can do it.

I do not pretend that I have had Observations made with all the Precision requisite, to lay down incontestably the *Magellan* Straights in their true Geographical Site; but yet it has not been without good Grounds that I have placed them as I have done. For when Sir *John Narborough*, in the year 1670, wintered in Port *St. Julian*, on the Coast of *Patagonia*, Capt. *John Wood*, then his Lieutenant, and an approved Artist in Sea Affairs, did observe the beginning of an Eclipse of the Moon, Sept. 18. *Stil. vet.* at just 8 at Night: And the same beginning was observed by M. *Hevelius* at *Dantzick* at  $14^h 22'$ ; whence Port *Saint Julian* is more Westerly than *Dantzick*  $6^h 22'$ , or than *London*  $5^h 6'$ , that is  $76\frac{1}{2}$  Gr. Besides, I have had in my Custody a very curious Journal of one Capt. *Strong*, who went into the *South Seas* in quest of a rich Plate-wreck, and who discover'd the two Islands he called *Falkland's Isles*, laying about 120 Leagues to the Eastwards of the *Patagon* Coast, about the Lat. of  $51\frac{1}{2}$ . This Capt. *Strong* had a quick Passage from the Island of *Trinidad* (in  $20\frac{1}{2}$  South) to the *Magellan* Straights; and in this Journal, which was very well kept, I found that Cape *Virgin* was, by his Account, 45 Degrees of Longitude more Westerly than that Island, whose Longitude I know to be just 30 Degrees from *London*: that is in all 75 Gr.

From these concurrent Testimonies, wanting better, I adventured to fix the Longitude of this Coast as I have done; and I can by no means grant



grant an Error of 10 Degrees to be possible in it, though perhaps it may need some finaller Correction. I will however readily grant, that those that go thither from *Europe*, shall find the Land more Easterly than is here exprefs'd, by reason of a constant Current setting to the Westward near the Equator, where Ships are many times long detained by Calms, whilst the Stream carries them along with it; which thing befalls all Ships bound to any part of the East Coast of the *South America*.

Variation.		Latitude.		Longit. from <i>London</i> .	
8°	32' West.	49°	18' North.	07°	29' West.
6	42	44	31	13	45
5	30	41	06	15	08
5	04	40	22	14	54
4	22	39	11	15	35
3	30	32	21	15	39
3	35	32	42	15	38
1	20	18	50	20	52
1	14	09	26	17	59
1	10	00	49	18	42
1	00	01	09 South.	18	58
0	16	02	32	19	48
0	00	03	17	20	05
0	40 East.	03	58 South.	20	27
1	02	05	09	21	39
1	30	06	21	22	08
1	50	08	03	23	15
2	10	09	07	23	35
3	32	12	03	25	03
6	04	18	53	26	30
6	19	19	51	27	02
6	20	21	26	28	14
6	30	21	48	28	10
7	00	21	58	28	23
6	45	24	45	27	56
6	36	27	11	27	17
5	04	33	53	16	58
0	00	34	21	01	29
1	00 West:	34	15	01	33
4	16	33	41	06	23
8	46	34	39	13	02
11	56	34	30	16	15
11	30	32	51	13	41
10	00	30	21	11	46

IV.  
*The Variation of the Magnetical Needle, in the Atlantick and Æthiopick Oceans, by Mr. Joh. Maxwell, n. 310. p. 2433.*

30" East.

At the Cape of Good Hope.



Variation.		Latitude.		Long. from London.	
09	44' West.	29°	51' South.	11°	44'
09	34	29	28	11	31
09	22	28	56	11	05
09	04	27	38	10	01
08	30	26	55	08	45
08	02	25	41	07	22
07	32	24	32	05	43
01	52	16	00	06	30

West at the  
Isle of St. Helena.

### V. Papers of less general Use, Omitted.

- n. 276. p. 1022. 1. A Letter from Dr. Wallis to Sir Hans Sloane, with some Hints for drawing up an Historical Account of the Invention and Improvements of the Magnetical Needle.
- n. 278. p. 1106. 2. A Letter from the same to Dr. Edmund Halley, expressing his entire Approbation of the Doctor's Map of Variations, and recommending the drawing up a Magnetical History to him.
- n. 335. p. 506. 3. Experiments of the Power of the Loadstone at different Distances, by Mr. Hawksbee. This is the Paper mentioned by Dr. Taylor in the second Tract.
- n. 339. p. 69. 4. A Letter from Dr. Mather in New England, to Mr. Waller, confirming the Account given in No. 157. Abr. Vol. II. p. 180. of a Ship Compass that had its Poles chang'd in a Thunder Storm.

## C H A P. V.

### Botany, Agriculture.

I. **T**HE Counties of Londonderry and Donnegall are very mountainous, and those Mountains covered with Bogs and Heath, in so much that there is little Arable Ground in them, except what has lately been made so. There are three ways practis'd to reduce Heath and Bog to Arable Land: The first is by cutting of the Scurf of the Ground, making up the Turf so cut in heaps, and when the Sun has drierd these heaps, they are then set on Fire; when burnt as much as they can be, then those heaps are scattered on the Ground, and it being plowed, it beareth Barley, Rye, or Oats, for about three Years. The Inconveniences are, that such burning defiles the Air, causeth Rain and Wind, is not practical in a wet Summer; and by destroying the Sap of the Earth



Earth and Roots of the Grass, and all other Vegetables, renders it useless for several Years after the third, in which it is plowed.

The second way is by Liming; this is much better than the former, because it doth not so much Depauperate the Ground, will last long, and beareth better Grain, and whatever is pretended, doth not destroy the Grass, if due care be taken not to over Plow it; but then this is very dear, and Lime-stone is not every where to be had, and in many Places Fire is wanting.

Marl is not used, that I have observed in the North, but about the Sea side the great Manure is Shells: Towards the Eastern part of the Bay of London, commonly called *Loughfoyle*, there lies several Eminencies that hardly appear at Low Water; these are made of Shells of Sea-fish of all sorts, more particularly of Perriwinkle, Cockles, Limpet, &c. The Country Men come with Boats at Low Water, and carry Loads of these Shells away; they leave them in heaps on the Shoar, and there let them lie till they drain and dry, and by that means become much lighter for Carriage; they carry them by Boats as far as the Rivers will allow them, and then in Sacks on Horses perhaps six or seven Miles into the Country; they allow sometimes 40, but mostly 80 Barrels to an Acre; they agree with boggy, heathy, clay, wet, or stiff Land, but not with sandy. They seem to give the Land a sort of ferment, as Barm doth to Bread, opening and loosening the Clods, and by that means making way for the Roots to penetrate, and the moisture to enter into the Fibres of the Roots: The Manure continues so long, that I could find none that could determine the time of its enduring. The Reason whereof seems to be that the Shells melt every Year a little till they be all spent, which requires a considerable time, whereas Lime, &c. operates all in a Manure at once; but it's to be observed, that in six or seven Years the Ground grows so mellow, that Corn that grows on it becomes rank and runs out in Straw to such a length, that it can't support it self, and then the Land must be suffered to lie a Year or two, that the ferment may be a little quieted and the Clods harden, and then it will bear as long again, and for ought I know and could find it, continues to do so with the like Intermissions for 20 or 30 Years.

In the Years in which the Land is not plowed, it bears a fine Grass mixed with Daiesies in abundance; and it is pleasant to see a steep high Mountain, that a few Years before was all black with Heath, on a sudden look white with Daiesies and Flowers. It fines the Grass, but makes it short though thick: Observing that this Manure produced Flowers in the Field, I made my Gardener use these Shells in my Flower Garden, and never saw better Carnations, or Flowers fairer or larger than in that cold Climate; and it contributes to destroy Weeds, at least doth not produce them so much as Dung; it likewise produces very good Potatoes at about a Foot distance from one another; and this is one Method of reducing boggy barren Land. They lay a little Dung or Straw on the Land, and sprinkle it with Shells; sometimes they cut the Po-  
tatoes



tatoes if large, that they may go the farther, and then dig Trenches about six or seven Foot distance, and throw the Earth or Soil they take out of them on the Potatoes, so as to cover them, and then fencing the Plot of Ground so planted, let them grow. Plant them in *April* or *May*, and they are ripe in *August*; they dig them as they have occasion, and let them lie till next Year, then dig them again, and so the third Year, every Year they by this means go deeper in the Earth, and at the last they dig them, then pick them out as carefully as they can, that little Seed may remain; and the fourth Year they Plow the Ground and sow Barley, and the Produce is very good for some Years; some Potatoes will remain and grow up without any hurt to the Barley or Oats, and those they dig and pick out, and the Ground remains good and Arable ever after.

'Tis observable, that Shells do best in boggy Ground, where the Surface is Turf; Turf generally is nothing but the Product of Vegetables, such as Grass, Heath, &c. that being rotten, the Salt is washed away by the Water, and there remains only the earthy, and especially the sulphureous parts of them, as appears from the Inflammability of Turf; now Shells being chiefly a Salt, it incorporates with the Sulphur of the Plants; and renders them fit for the Vegetation of new Plants. And this appears further from this, that Shells, that have been under the Salt Water, are much better than such as have been in the Earth, or dry at the Strands: Almost about the Bay of *Londonderry* if you dig a Foot or two it yields Shells, and whole Banks are made up of them; but these, though more intire than such as are brought out of the Shell Island, are not so profitable for Manure.

I observed in a place near *Newtown Lamavady*, about two Miles from the Sea, a Bed of Shells, such as lie on the Strand; the place was cover'd with a Scurf of wet spouty Earth about a Foot thick; the Country People used the Shells, but they were not reckon'd so good as those that are found in the Sea or near it.

Some thousands of Acres have been improved by the Shells, and that which formerly was not worth a Groat *per* Acre, is now worth four Shillings: They have in many Places thus improved the Mountains that before were very Turf Bogs. In these they meet with this Inconveniency, that if the Season for Plowing proves wet, their Horses sink so deep in the Soil, that they can't Plow it, especially after two or three Years.

They commonly made Lime of the Shells formerly, and some do so still. I have not, that I remember, seen any such Lime, but I understood that it bound very well, and I believe it is not so corrosive as Lime made of Stone; for I find in the History of *Ceylon*, that they make up their Land with Lime of Oyfter-Shells, and which I believe, would be impracticable with common Lime. About thirty Years ago they made Lime of the Shells, and manured their Lands with it; but a poor Country-man, that out of Laziness or Poverty had not provided



to make Lime, threw the Shells unburnt on his Land; his Crop proved as good as his Neighbours, and the second and third Crop better, and all took the hint, and have used them so ever since. Where Shells are not to be procured, Sea Rack or Sand supply the want of them, but are not so good; Sea Rack lasts but three Years, and Sand little longer.

'Tis certain *Ireland* has been better inhabited than it is at present; Mountains that now are covered with Bogs, have formerly been Plowed: for when you dig five or six Foot deep, you discover a proper Soil for Vegetables, and find it Plowed into Ridges and Furrows: This is observable in the wild Mountains between *Ardmagh* and *Dundalk*, where the Redoubt is built, and likewise on the Mountains of *Altmore*: The same, as I am informed, has been observed in the County of *Londonderry* and *Donegall*; a Plow was found in a very deep Bog in the latter, and a Hedge with Wattles standing, under a Bog that was five or six Foot deep above it. I have seen the Stump of a large Tree, in a Bog ten Foot deep at *Castle-Forbes*; the Trunk had been burnt, and some of the Cinders and Ashes lay still on the Stump. I have seen likewise large old Oaks grow on Land, that had the Remains of Ridges and Furrows. And I am told, That on the top of an high Mountain in the North, there are yet remaining the Streets and Footsteps of a large Town; and in truth, there are few places, but either visibly, or when the Bog is removed, there remains marks of the Plow; which sure must prove, that the Country was well inhabited. It's likely that the *Danes* first, and then the *English* destroyed the People; and the old Woods seem to those that pretend to judge, to be about three or four hundred Years standing, which was near the time that *Courcey* and the *English* subdued the North of *Ireland*, and 'tis likely made havock of the People that remained after the *Danes* were beat out of *Ireland*.

II. The burning of the Surface is so much practis'd in *Devonshire*, that 'tis elsewhere known by the Name of *Devonshiring*; but 'tis us'd only for bad Lands by worse Husbands, for it robs the Ground.

Salt quickens dead Land, and is us'd in the South West part of that Country, which would else be the barrenest, but is now the richest part of it. They go as far as the Sea will permit them at the lowest Ebb, and take the Sand in Bags, and carry it on Horseback fourteen Miles into the Country and spread it upon the Land, and thereby improve it both for Corn and Grass. In other parts they force their barren Land, by mingling the Earth with Lime, and casting it on the Ground.

In this they differ, that crude and single Salt, often strew'd on the Ground, does not improve, but corrode it: but Lime, though unmingled, betters it: but in this they agree, that they produce not Grass fit for the Scythe, but for Pasture, short and sweet, and growing all the Winter so that their Sheep know neither Hay nor Water, nor are their highest Grounds parch'd by the Sun in the hottest Summer. The Sea Salt is too lusty and active of it self; the Lime has a more balsamick, but gent-



ler Salt ; and regularly join'd with the other, is thereby invigorated. How to match these two, *Glauber* thus directs. Take Quick Lime, let it slack by time without Water ; then take Salt and Water, mingle them together, and make them into Balls or Pieces, which you please, dry 'em as you do Bricks, then burn them for about two Hours. This Compost will enrich your poorest Land.

Observations  
concerning Ve-  
getation, by  
Mr. Dela  
Pryme, n. 281,  
p. 1214.

III. Some have made Experiments of Meliorating, Fertilizing and Multiplying of Grain, by steeping them in divers Liquors. *Digby* somewhere mentions a Plant of Barley, all rising from one Corn, that by steeping and watering with Saltpeter, dissolv'd in Water, brought forth 249 Stalks, and above 18000 Grains. And the last Edition of *Cambden* mentions a thing very observable, that the Corn sown in a Field in *Cornwal*, after a great Battle in the Civil War time, brought forth four or five Ears on every Stalk. I have tryed some such like Experiments on several Grains, as follows.

Upon the 22d of *March*, 1699. I laid to steep, A Pea, a Barley Corn, and a Wheat Corn, in *Brimstone Water*. A Pea, a Wheat, a Barley and an Oat Corn, in *Allom Water*. A Pea, a Wheat, a Barley, and an Oat Corn, in an old Dissol. of Salt of Tartar. A Pea, a Wheat, a Barley, and an Oat, in the *Cap. Mort.* of *Sal Arm.* dissolved in Urine. A Pea, a Wheat, a Barley, and an Oat, in the dissolve of the Salt of Walls. A Pea, a Wheat, a Barley, and an Oat, in the dissol. of Saltpeter. A Pea, a Wheat, a Barley, and an Oat in *Nostoc* or Star Gelly. A Pea, a Wheat, a Barley and an Oat Corn in Urine.

I steep'd them thus five Days and five Nights, and set them in a Garden in a good Soil, against a North Wall, full in the Sun, on the 27th of the same Month, after a rainy Night, with a Pea, a Wheat, a Barley and an Oat unsteeped. Upon the 10th of *April* following, I went to see them, and found that some were just come up, some not.

The Pea, the Barley and the Wheat steep'd in *Brimstone Water* all up together. The Pea steep'd in *Allom Water* very big and swell'd, but not so much as sprouted, but the Barley, Wheat and Oat above ground. The Pea steep'd in the old Solution of Salt of Tartar, was half come up, the Wheat scarce sprouted, but the Barley and Oat quite up. The Pea, the Wheat, the Barley and Oat steep'd in the *Caput Mort.* of *Sal Armoniac* dissolved in Urine, were all up together; as were also the next row that were steep'd in the Solution of Salt Walls. The Pea and Wheat steep'd in the Dissolution of Saltpeter, were about half up, but the Barley and Oat quite up. These which were steep'd in *Nostoc*, were none of them come up, nor scarce sprouted. The Barley and Oat steep'd in Urine were come up, but the Pea and Wheat scarce sprouted. And lastly, to my great Surprise, the Pea, the Wheat, the Barley and the Oat that were not at all steeped, were all of them as soon up as any of the former, except only the Wheat, which was about half up. I set them



them all a Finger deep in the Ground, and there was all the time of their growth very fine Weather.

From all which I humbly suppose that Allom Water is against the nature of Peas, and retards their growth, but agrees well enough with Wheat, Barley and Oats. That the Solution of Salt of Tartar is not friendly to the nature either of Peas or Wheat, but agreeable or concordant to the nature of the Oats and Barley. That the Water of Saltpeter had not here any of the great Power or Vertue that I expected, &c. And that these steepings did not further any of the said Grains in their growth and coming up, but manifestly and plainly retarded some or most of them.

Then I digged all of them up but three spires of Barley, which I let stand about a Foot and a half, or two Foot, one from another, which grew and encreased so exceedingly, that they had sixty, sixty five, and sixty seven Stalks apiece from their single Grain and Root, with every one an Ear on, and about forty or somewhat more Corns apiece in them, which increase proceeded perhaps not so much from the Grain having been steeped in any Liquors, as from the Fertility and Goodness of the Soil, and their competent distance one from another. I observe that new Shoots continually struck up from the Root; and that, as in the *East* and *West Indies*, there are Trees that always bear Blossoms, and Flowers, green and Ripe Fruit at the same time, so that here if the invigorating heat of the Sun had not been cool'd and weakned by the approach of the Winter Season, there would have continually been new, ripe Corn, and empty Ears on the same Root.

IV. Plants in general are either *Terrestrial*, *Amphibious* or *Aquatick*: and so nearly do Vegetables agree with Animals in most Points, except local Motion and its Consequences, that from the Knowledge of the one we are reasonably led to the Discovery of the other.

*Of the Motion of the Sap in Vegetables, by Mr. Rich. Bradley, n. 349. p. 486.*

Those Plants I call *Terrestrial* are Trees, Shrubs, and Herbs, which grow only on the Land. These like Land Animals have Diversities of Food, a Method of generating, and certain Periods of Life.

Of the *Amphibious* Race, which live as well on Land as Water are the Willows, Rushes, Minths, &c. these are not much unlike in many respects to the Otter, Tortoise, Frog, &c.

The *Aquaticks*, whether of Lakes, Rivers or Seas are very numerous; these may be compar'd with the Fish kind, and like them will not live out of their proper Element. In *fresh Waters* are the *Water-Lilly's*, *Plantains*, &c. and in the *Sea*, *Corals*, *Fuci*, &c.

*Plants* seem to possess only the next degree of Life below the most stupid *Animal*; or where Animal Life leaves off, the Vegetable Life seems to begin. The Seasons of Motion in *Plants* are the same with those of *Animals*, which sleep during the Winter. An Artificial Heat will give Motion to either of these in the coldest time.



The common Opinions relating to the *Saps* Motion are as follows. First, The *Sap* does not rise by the *Pith*; because some have observ'd the Trunks of large Trees to be without that part, and yet the same Trees have continued to put forth Fruit, and Branches on their Tops. I have observ'd, that the *Pith* is not found in those Branches of a Tree which exceed two or three Years growth; and it is certain, that the *Pith* which is in a Branch of this Year, will (the greatest part of it) be distributed into those Boughs which form themselves the next Season.

It is said by some, that the Tree does not receive its Nourishment by the *Bark*, for that Trees having lost that part, will still continue their Growth. Others tell us, That if the *Bark* be cut away round the Trunk of a Tree, it will presently die. These various Opinions seem to have been set on Foot without extraordinary Consideration, upon the belief that a Tree has but one *Bark*: Whereas, upon Examination with the Microscope, we find four distinct Coverings to each Branch, without the woody parts. The two outermost *Barks* may be taken from a Tree without great Damage, but the other two which lye nearer the Wood being strip'd off will kill the Tree.

Some affirm, That the *Sap* doth neither rise nor fall in the woody part of a Tree, because they have not been able to discern any *Sap* to issue out of that part, when a Branch has been cut. The Microscope plainly shews us the Vessels in the Wood, through which the *Sap* riseth from the Root; but as these Tubes are not large enough to admit into them any thing more gross than Vapour, so they have not been esteem'd to be of any great Use. But I hope the Explanation of the adjoyn'd Figure will in some measure discover the Office of these, and of such other parts of a *Plant* as are severally design'd for the Growth of Vegetables; but it will first be convenient to enquire a little into the Nature of the *Root*.

The *Root* of a Tree is chiefly composed of a *Parenchyma*, more gross than that in the Stem or Body of the Tree; it has likewise Vessels and a Covering, which I shall better explain in another Paper. The *Root*, that is, the principal part of it, receives into it such Juices of the Earth as are proper for it, and no other. Somewhat like a Weck of Cotton, which having been impregnated with Oil, will only admit Oil into it. This Provision being made in the *Stomach* of the *Plant* (as I call it) chiefly in the Autumn Months, the Tree is prepared for Germination so soon as the Earth is sufficiently warm'd, either by the Sun's Beams, or an artificial Heat, such as Horse-Dung, Bran and Water, or other such like Ferments. These Heats raise into Vapour the Juices contained in the *Root*, and by that means cause Vegetation.

Figure 1. Is part of the Branch of an *Apple Tree*, made in May 1715, and cut in April 1716. It was cut in Figure of a half Cylinder, the length somewhat more than the Diameter, which was about a quarter of an Inch. This being magnified with one of *Campani's* Microscopes, discovers the following parts, viz.

Plate 10.

Fig. 1.



Fig. 6.



Fig. 8.



Fig. 9.



Fig. 7.



Fig. 1.

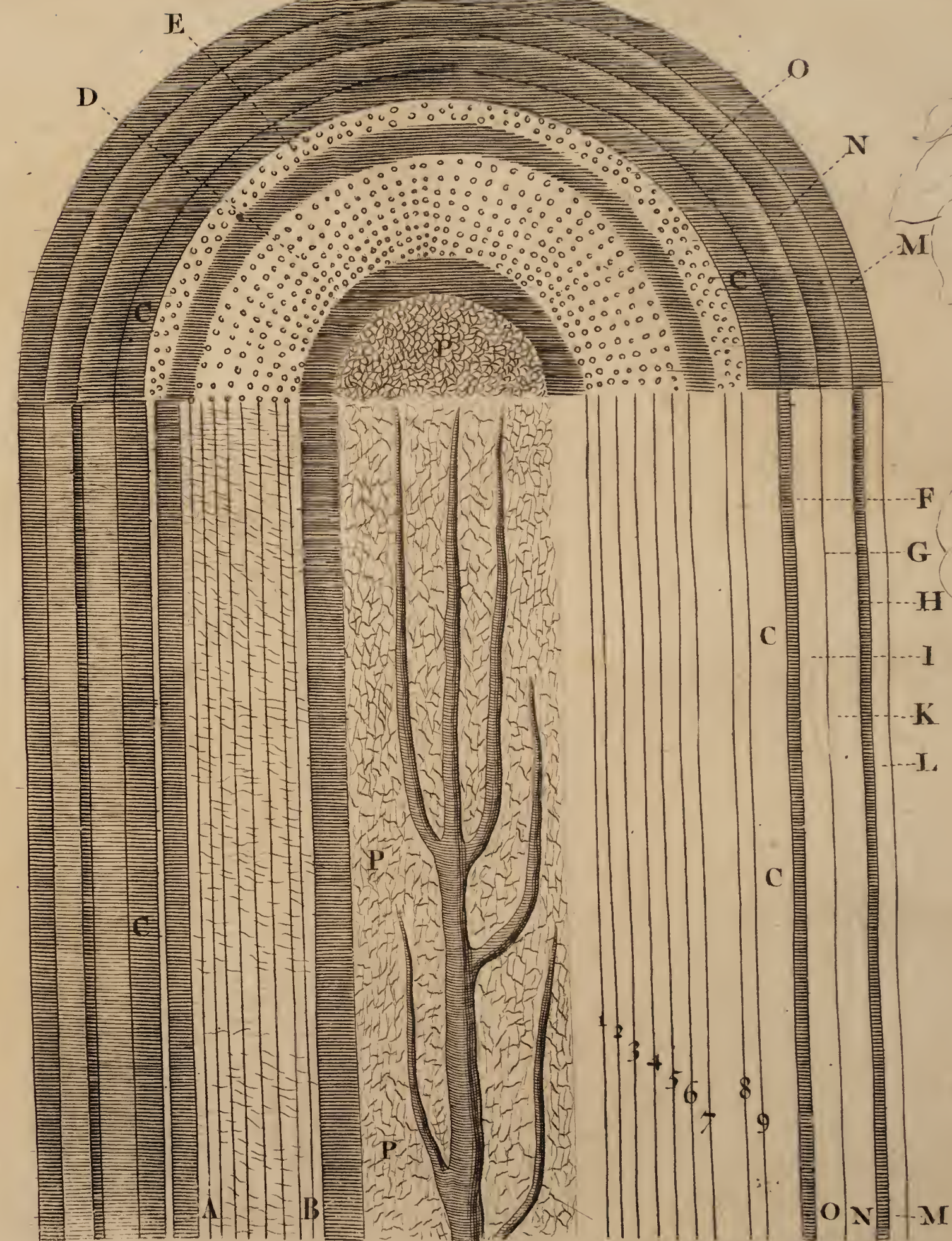


Fig. 2.



Fig. 3.



Fig. 5.

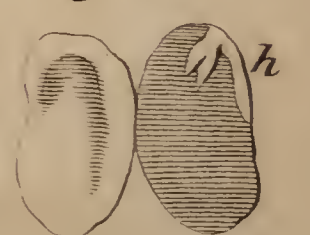


Fig. 4.









1, 2, 3, 4, 5, 6, 7. are Capillary Vessels, which run longitudinally through the Branch, in the Ligneous part, which was made in the Year 1715. Through these Tubes, the Steam riseth from the Root; the strength of which is well explained by the Engine for raising Water by Fire, invented by the late Captain Savory.

From *A* to *B*, we may view Vessels of the same sort, made at the same time.

8, 9. are Vessels of the same use with the former, now forming themselves for the use of the Year 1716.

By this means the Diameter of the Branch is increas'd, and additional Nourishment suffer'd to pass into those Buds which are to make new Branches. These are made out of the fourth or innermost Bark, markt *C*, *C*.

The Mouths of the Capillary Tubes of the Years 1715, and 1716. are *D*, *E*. The Vapour which riseth from the Root, is continued in these Vessels, to the Extremities of the Branches; where it meets with parts (not here describ'd) like to *Glands*; which *Glands*, if we may so call them, are likewise found at every Knot or Joynt. At these places, the Vapour coming near the Air is condensed, and returns between the Barks, by means of its own weight, down *F, G, H*, leaving in each Bark mark'd *I, K, L*, such Juices as each of them naturally is inclin'd to separate from it; till at last, the more Oily part passing to the Root, may lengthen the *Fibres* thereof, as Icicles are lengthned; and by its Oleous Particles, preserve them from Rotting by the Wet. The parts which composed the several Barks, are *Parenchymous* or *Spongey*.

The first mark'd *M*. is of a closer Texture than the second *N*. and the second closer than the third *O*, and so on till these *Parenchymous* Parts are interwoven with the longitudinal Wood-Vessels, where they are somewhat constrain'd, till they come to make the Pith mark'd *P*. Then they are much larger than in any other part of the Tree; and by what I have observ'd, seem to contain a more finish'd Juice than the rest, and may well enough be stiled the *Medulla*.

We may note, that when the fourth or innermost Bark *C*, has once compleated its Sap Vessels, and is firmly join'd to the wooden Part, then the third Bark *O* takes its place for the succeeding Year, and so the rest; except that the first mark'd *M*, splits and divides its self, to supply the place of the second.

V. Dr. *Grew* has observ'd, that the *Farina* (or fine Powder, which is at its proper Season shed out of those *Theca* or *Apices Seminiformes*, which grow at the top of the *Stamina*) doth some way perform the Office of Male Sperm. But herein I think he falls short, in that he supposes them only to drop upon the outside or the *Uterus* or *Vasculum Seminale*, and to impregnate the included Seed by some spirituous emanations or energetical Impress.

*Observations on the Parts and Use of the Flower in Plants, by Mr. Sain-Morland n. 287.p.147.*



That which is now in question is, Whether it be not more proper to suppose that the Seeds which come up in their proper *Involucra*, are at first like unimpregnated *Ova* of Animals; that this *Farina* is a *Congeries* of Seminal Plants, one of which must be conveyed into every *Ovum* before it can become prolific; that the *Stylus* in Mr. Ray's Language, the upper part of the *Pistillum* in Mr. Tournefort's, is a Tube designed to convey these seminal Plants into their Nest in the *Ova*; that there is so vast a Provision made, because of the odds there are, whether one of so many shall ever find its way into, and through so narrow a Conveyance. To make this Supposition the more credible, I shall lay down the Observations I have made upon the Situation of these *Stamina* and the *Stylus* in some few species of Plants. First, in the *Corona Imperialis*, where the *Uterus* or *Vasculum seminale* of the Plant stands upon the Center of the Flower, and from the top of this ariseth the *Stylus*, the *Vasculum Seminale* and *Stylus* together representing a *Pistillum*. Round this are planted six *Stamina*, upon the ends of each of these are *Apices* so artfully fixt that they turn every way with the least Wind, being in height almost exactly equal to the *Stylus* about which they play, and which in this Plant is manifestly open at the top, as it is hollow all the way. To which we must add, That upon the top of the *Stylus* there is a sort of *Tuft*, consisting of pinguid *Villi*, which I imagine to be plac'd there, to catch and detain the *Farina* as it flies out of its *Theca*. From hence I suppose the Rain either washes it, or the Wind shakes it down the Tube, till it reach the *Vasculum Seminale*. In *Caprifolium*, or *Honey-suckle*, there rises a *Stylus* from the Rudiments of a Berry, into which it is inserted to the top of the *Monopetalous* Flower, from the middle of which Flower are sent forth several *Stamina*, that shed their *Farina* out of the Cases upon the Orifice of the *Stylus*, which in this Plant is villous or tufted, upon the same Account as in the former. In *Allium* or common *Garlick*, there arises a *Tricoccous Uterus*, or Seed Vessel, in the Center of which is inserted a short *Stylus*, not reaching so high as the *Apices*, which thus over topping it, have the Opportunity of shedding their Globules into its Orifice more easily. For which reason I can discern no *Tuft* upon this (as in the former) to insure their Entrance, that being provided for by its Situation just under them.

I will offer now some such Reasonings or Reflections as the foregoing account doth suggest, and will support. Nothing can be more natural than to conclude, that where a fine *Powder* is curiously prepared, carefully repositied, and shed abroad at a peculiar Season; where there is a Tube so planted as to be fit to receive it, and such care in disposing this Tube, that where it doth not lye directly under the Cases that shed the Powder, it hath a particular *Apparatus* at the end to insure its Entrance. Noting can be more genuinely deduc'd from any Premises than from this it may, that this *Powder* or some of it was designed to enter this Tube. If these *Stamina* had been only excretory Ducts, as has been hitherto suppos'd, to separate the grosser parts, and leave the Juice design'd for the



the Nourishment of the Seed more reserv'd, what need was there to lodge these Excrements in such curious Repositories. They would have been convey'd any whither, rather than where there was so much danger of their dropping into the *Seed Vessel* again, as they are here. Again, the *Tube*, over the Mouth of which they are shed, and into which they enter, leads always directly into the *Seed Vessel*. To which we must add, That the *Tube* always begins to dye when these *Thecæ* are empty'd of their Contents; if they last any longer, it is only whilst the *Globules* which enter at their Orifice, may be suppos'd to have finish'd their Passage. Now can we well expect a more convincing Proof of these *Tubes* being designed to convey these *Globules*, than that they wither when there are not more *Globules* to convey.

If I could now show that the *Ova*, or unimpregnated Seed, are ever to be observed without this *Seminal Plant*, the Proof would arise to a Demonstration; but I have not been so happy as to discern this. Tho' in the mean time, I have made some Steps towards a Proof this sort, and have met with some such Hints as make me not despair of being able, in a short time, to give the World even this Satisfaction. For, not to insist upon this, that the *Seminal Plant* always lies in that part of the Seed which is nearest to the Insertion of this *Stylus*, or some Propagation of it into the *Seed Vessel*; I have discovered in *Beans* and *Peas*, and *Phaseoli*, just under one end of that we call the *Eye*, a manifest Perforation (discernible by the grosser sort of magnifying Glasses) which leads directly to the *Seminal Plant*, and at which I suppose the *Seminal Plant* did enter; and I am apt to think that the *Beans* or *Peas* which don't thrive, will be found destitute of it.

But I must now proceed to describe some other Plants, whereby it will appear, that there is a particular care always exercis'd to convey this Powder, so often mentioned, into a *Tube*, which may convey it to the *Ova*. Now in *Leguminose* Plants, if we carefully take off the *Petala* of the Flower, we shall discover the *Pod* or *Siliqua* closely cover'd with an involving Membrane, which about the top separates into many *Stamina*, each fraught with its quantity of *Farina*, and these *Stamina* are close bound upon the *Brush*, which is observable at the end of that *Tube*, which here also leads directly to the *Pod*; it stands not upright indeed, but so bended as to make near a right Angle with it.

In *Roses* there stands a *Column*, consisting of many *Tubes* closely clung together, though easily separable, each leading to their particular Cell, the *Stamina* in a great number planted all round about. In *Tithymalus*, or *Spurge*, there rises a *Tricoccus* Vessel, that whilst it is small and not easily discernible, lyes at the bottom till 'tis impregnated, but afterwards grows up, and stands so high upon a tall *Pedicle* of its own, as would tempt one to think that there were to be no Communion betwixt this and the *Apices*, which he sees dying below. In *Straw-berries* and *Ras-berries*, the Hairs which grow upon the ripe Fruit (which I suppose may be surprizing to some) are so many *Tubes* leading each to their particular



ticular Seed, and therefore we may observe, that in the first opening of the Flower there stands a Ring of *Stamina* within the *Petala*, and the whole inward *Area* appears like a little Wood of these Hairs or Pulp, which when they have received and convey'd their *Globules*, the Seeds swell and rise in a carneous Pulp.

I shall content my self with suggesting, that hence one would conclude that the *Petala* of the Flower were rather design'd to sever superfluous Juices from what was left to ascend in the *Stamina*, than the *Stamina* to perform this Office, either for them, or the unimpregnated *Semina*. And observe the Analogy between *Animal* and *Vegetable* Generation, as far as was necessary there should be an Agreement between them.

The Explication  
of the  
Figures.  
Plate 10.

Fig. II. Represents a yellow Lilly. *A* the top of the *Pistillum* or Tube, at which the Seminal Plants are suppos'd to enter, and through which they are convey'd to the unimpregnated Seed in the Seed Vessel. *b b b b b b* the *Apices Seminiformes*, which, when they are ripe, open, and shed that Powder which enters the Tube at *A*. *C* The place of the Seed Vessel at the bottom of the Tube, the Seed Vessel it self being concealed under the Leaf in this Draught.

Fig. III. *D*. The *Siliqua* in a Flower of the Pea kind. *E*. The Tube which arises from the *Siliqua*, and conveys the Plants to it. *F*. The Membranous Coat that involves the *Siliqua* laid open. *g g g g g g*. The *Apices*, which, before the Membranous Tegument is laid open, appear to rise from its edges, and by the *Petala* of the Flower are kept close upon the Orifice of the Tube, that they may conveniently shed their *Farina* into it.

Fig. IV. A French Bean represented sidewise.

Fig. V. The same open'd. *h*. the Seminal Plant. *i*. A Perforation, at which 'tis suppos'd the Seminal Plant first enter'd.

The Husbandry  
of Canary Seed.  
by Mr. Edw.  
Tenison,  
n. 337. p. 91.

VI. To prepare Land for this Seed, let it be broke up some time in April, and plough'd again about *Midsummer*, and plough'd again in August, that by frequent Tillage the Weeds may be burnt up and destroyed. Plough the last time about the latter end of February, or the beginning of March, if the Season proves dry; if not, you had best wait for a dry Season; for in such a Season only will the Ground be fit to receive the Seed. With a Hoe, (that has a Bit about the bigness of an Onion-Hoe,) you must from time to time carefully cut up the Weeds. If they are not kept entirely under, much of the Seed will be lost for want of ripening. In very good Land half a Bushel of Seed will be enough to sow an Acre. It will thrive best upon a stiff Clay; it will grow upon any sort of loamy Land, that is rich enough to bear Hemp. If you apprehend that the Land is not sufficiently strong, you will do well to allow from half a Bushel to seven Gallons of Seed to sow an Acre with. The Seed is ripe sooner or later, according as the Spring



Spring affords you an early or late Season of sowing it. In some Summers 'tis cut in *August*, but the most usual time is after Wheat-Harvest. When it is cut, it must in most Years lie 5 or 6 Days in swarth, and then be turn'd, and lie till one side is dry'd and rotted as much as the other, which may be about 4 or 5 Days longer. The certain number of Days can't be fix'd, because they must be more or less, according as the Weather proves fair or rainy.

The reason of its lying so long in swarth is, That the lower Heads of the Seed (being exposed to the Air Wind and Sun) may the better perfect their ripeness, and the Grass and Weeds that sprung up with the Stalks be thoroughly wither'd, and the Ears or Heads well and sufficiently rotted, that the Seed upon threshing may come out clean. The Produce upon Land that is very good, is about six Quarters per Acre. If the Land be but indifferent, or if the Weeds be not kept under, then from four to five Quarters upon an Acre is as much as you can expect. The Price of Seed is from two Pounds to six Pounds per Quarter; but the most usual Price is from Forty Shillings to Three Pounds.

It is difficult to Thresh. So much of the Seed, as after threshing, is beaten out (as soon as 'tis fann'd) is to be run through a Wire Sieve (such as is used to separate Cockle from Corn) and the Husks of every sifting, that will not pass through the Sieve, are to be thrown by in a heap to be thresh'd over again. The ordinary Price for threshing is Five Shillings, but in some Years the Thresher has Six Shillings per Quarter.

VII. At *Sutton Coldfield* in *Warwickshire*, a peaty Ground near a Pool (of which it was formerly a part) was sown with Turnip Seed on the second Day of *July* 1702. In less than three Days Time the Turnips were seen above Ground. At three Weeks end the Roots were in Bigness equal to Walnuts. Within less than five Weeks after the Sowing, the Gardner drew great Quantities of Turnips to sell, they then being as big as large Apples. At the end of Six Weeks, *viz.* on the 12th Day of *August*, a large Turnip was plucked up (though probably not so big as several others then growing upon the same Ground) which, together with its top and long descending part of the Root, weighed above two Pounds and fourteen Ounces. At the same time also was weighed an Ounce of the same sort of Turnip Seed, that the Gardener had sown his Ground with; and afterwards a Thousand of the Grains were counted singly out of the Ounce so weighed; and the rest of the Ounce was divided into Heaps, as near as could be guessed, equal to the 1000 Seeds first severed and laid together: And it was found that the whole Ounce contain'd above 14600 single Grains; which number multiplied by 46 (*viz.* the number of Ounces that the Turnip weighed) produceth 671,600, *viz.* the number of single Grains of Seed required to equal the Weight of the Turnip. From whence may be gathered, that (upon Supposition, that the Increase of the Turnip was all along uniform and equal

*Instances of the very great and speedy Vegetation of Turnips, Communicated by Dr. J. Desaguliers, n. 350. p. 974.*



equal, from the time it was sown till it was pluck'd up) the Grain of Seed which it sprung from, weighing when it was sown but  $\frac{1}{4600}$  of an Ounce, was increased in Weight according to the following Proportions, viz.

Every	In Six Weeks time — 671,600		} times its own Weight.
	Week ————	111,933 $\frac{1}{3}$	
	Day ————	15,990 $\frac{1}{2}$	
	Hour ————	666 $\frac{1}{4}$	
	Minute of an Hour } ————	11	

Some time after, another Ounce of the same sort of Seed was exactly weighed, and the Grains were found to be in Number 14673.

Another Turnip of the same Crop was plucked up on the 21st Day of October; and being put into a Scale, was found to weigh above ten Pounds and an half; which unusual and truly wonderful Bulk it acquired (it being supposed, as above, that the Growth was all along alike) by increasing the weight of the Seed it was raised from, 15 times in every Minute of an Hour from the sowing to the drawing of it. The Gardener neglected to thin his Turnips in due time, else probably their Growth had been more considerable.

At another Time, in two other sorts of Turnip-Seed, it was found by counting, that an Ounce of one sort contained 14702 Grains; and an Ounce of the other sort no fewer than 14905 Grains. It's credibly reported, That of late Years, Turnips have been pretty frequently found growing in several Counties of this Kingdom, that have weighed above twice as much; one of which was seen at *Birmingham* about the Year 1710.

Of the Mouldi-  
ness in a Melon,  
by Mr. Rich.  
Brailley, n.  
349. p. 492.

VIII. I had lately a large Melon Fruit, which I split lengthways thro' the middle, in order to observe the Vessels which compos'd the Membrane or Tunick of each Ovary; but my Affairs not permitting me to go on, I laid by the one half to be examin'd at more leisure. At the end of four Days, I found several Spots of Mouldiness began to appear on the fleshy part of the Fruit, somewhat green towards the Rind; and of a paler Colour towards the middle of the Fruit. These Spots grew larger every Hour, for the space of five Days; at which time the whole Fruit was quite cover'd. This surprizing Vegetation made me curious to examine, if there was any difference between those parts which were green and the others, besides their Colour. The first being seen with the Microscope, appear'd to be a *Fungus*, (see Fig. 6.) whose Cap was filled with little Seeds, to the number of about five hundred; which shed themselves in two Minutes after they had been in the Glasses. The other sort had many Grass-like Leaves, among which appear'd some Stalks with Fruit on their top. Each Plant might well enough be compared to a sort of *Bull-Rush*, (Fig. 7.) They had their Seed in great Quantities



Quantities, which I believe were not longer than three Hours before they began to Vegetate; and it was about six Hours more, before the Plants were wholly perfected: for, about seven of the Clock one Morning, I found three Plants at some distance from any others; and about four the same Day, I could discern above five hundred more growing in a Cluster with them, which I supposed were Seedling-Plants of that Day. The Seed of all these were then ripe and falling.

When the whole Fruit had been thus cover'd with Mould for six Days, this Vegetable Quality began to abate, and was entirely gone in two Days more. Then was the Fruit putrified, and its fleshy parts now yielded no more than a stinking Water, which began to have a gentle Motion on its Surface, that continued for two Days without any other Appearance. I found then several small Maggots (*Fig. 7.*) to move in it, which grew for the space of six Days; after which they laid themselves up in their Bags. Thus they remain'd for two Days more without Motion, and then came forth in the shape of Flies. (*Fig. 8.*) The Water at that time was all gone, and there remain'd no more of the Fruit than the Seeds, the Vessels which compos'd the Tunicks of the Ovarys, the outward Rind, and the Excrement of the Maggots; all which together weigh'd about an Ounce. So that there was lost of the first weight of the Fruit when it was cut, above twenty Ounces. We may judge from this, and other Cases of the like nature, how much Vegetable Life is dependent on Fermentation, and animal Life on Putrification.

IX. There are two sorts of Tobacco, which both they call *Dunkol*, the Signification is a smoaking Leaf, for *Dun* is Smoak, *kol* a Leaf, the one they call *Hingele Dunkol* or *Singele Dunkol*, for they make no Distinction of *H* and *S*; the other is called *Dunkol Kapada*, which Word *Kapada* signifies gelding, and is derived from the Portuguese; which Tobacco is very intoxicating, and much stronger than the former, it is the same Plant, the difference is only that *Singelese* Tobacco has little attendance, upon the other a great deal of pains is taken until it be fit for use, and it is done thus: They clear a little piece of Ground, in which they sow the Seed of Tobacco, as the Gardiners here sow Parsly and Coleworts; against the time that this is ready for transplanting, they choose a piece of Ground, which they hedge about; when the Buffelo's begin to chew the Cud, they are put within this Hedge Ground, and let stand until they have done, and this they continue Day and Night, until the Ground be sufficiently dunged; then the Ground is tilled with a Spade, in form of a Pick-axe such as Carpenters use when they smooth Planks, by howeing the Ground, and turning the same, and mixing the Dung among the Earth; when they have made the Ground smooth, they remove the Plants out of the Bed wherein they were sown, and set them in this Ground, about a Foot distance one from another, and then they grow up almost like a Dock; when the

*Observations on the Planting and Culture of Tobacco in Zeylan, by Mr. Strachan, n 279 p. 1164.*



Stem has got 15 Leaves, they cut off all the tops of the Plants; if they desire not to have the Tobacco to be very strong, they let it grow until it have 18 or 20, if they will have it stronger, they top it when it has got 10 or 12 Leaves, not counting the 3 or 4 lowest Leaves, which are nearest the Ground, because they never grow so big and good as those above them. Thus the moisture of the Ground being hindered to waste in more Leaves, Flowers and Seed, all the said moisture enters into the Leaves remaining, so that these Leaves will be 4 or 5 times larger, fuller of fatness, strength and vertue, than the Tobacco which is not ordered after this manner. Now the moisture ascending from the Root, being constrained within the Bounds of these Leaves, forces his way betwixt the Stem and Leaves remaining, and sends forth young Sprouts, and would grow forth in Branches, if no care were taken to hinder. Therefore every 3 or 4 Days they go through all the Stems, and break off these Buds whenever they spring forth, and this they continue until these Leaves be ripe (which takes as much time as the *Singele* Tobacco does, which gets Flowers and ripe Seed, and then begins to wither and spoil, if no use be made of it) which is known by the thickness and firmness.

Then before the Leaf begins to wither and is green, they cut down the Stem together with the Leaves; and do bring them into their Houses, and lay them in a heap, and thus the Leaves will begin to ferment, turn hot and sweat; then when the Leaves begin to sweat, they turn the innermost outmost, that they may easily ferment, otherwise the innermost would ferment too much, spoil and rot; thus the longer they lye in a heap together, the Tobacco turns the more dark of colour. When they think it has sweat enough, they hang it asunder upon Cords, until the Leaves be dry, then they separate the Leaves from the Stalks, and lay them up in Bundles together until they have use for them.

Now the other Tobacco, called *Singele Dunkol*, is only sown and then planted, and has liberty to grow, to shoot out Flower and Seed, thus all ripen together, then it is cut down and cast together in a heap; some will ferment too much and rot, others will ferment not at all, and will remain green, although it be dry, and will have a smell of Hay or dry Grass. The Souldiers, who delight to smoak a big Pipe full, and that frequently in one Day, do smoak this common sort; some will mix some of the *Kapada* among it; the *Cingaleses*, who smoak not so much at once, neither so frequently, do take a piece of the *Kapada* and roll it together, then roll a piece of dry Leaf of the *Wattukan* Trees about this, and kindle it at one end and suck at the other, until it be consumed. Some do chew it among Betle, taking but very little at once.

*A Seed in Ceylon, of great Virtue against the Stone, by Dr. Hotton, n. 208. p. 760*

X. Attmella, Acemella, & Hacmella, istis enim nominibus missa mihi Anno 1691. semina ex insula Ceylon, ubi nascitur & familiaris est. Ipsa planta, quam colui Anno 1692. flores fert in caulium summis.



mis ex multis Flosculis tubulosis coagmentatos, in caput coactos, & perianthio Hexaphyllo aut Polyphylo suffultos, perquam similes Chrysanthemo Curassaviro, alato caule, Flore aurantio, sed luteolos; quibus excussis sequuntur semina ex fusco grysea, longa, plana, summa sui parte duplici arista prædita, ipsis flosculis subjecta; caules edit quadratos, Foliis conjugatis Lamii aut Urticæ longioribus & acriusculis vestitos, ex quibus conjicitur spectare hanc plantam indubie ad Corymbosarum gentem & genuinam esse sobolem ejus generis, quod Bidens a femine bidente vocat Cæsalpinus eumque secutus Tournefortius. Quare cum hætenus nomine careat hæc planta, hoc ex ipsius plantæ ingenio ei imponendum censeo.

Bidens Urticæ folio Lithontriptica Zeylanica. Inter omnia enim Medicamenta quæ in comminuendo calculo valere perhibentur, planta hæc nuperis annis facta est celeberrima. Miles quidam, qui primus Anno 1690. Societati nostræ Indicæ indicium hujus herbæ dedit, profitebatur se plusquam centum ægros ejus ope liberasse a calculo & Nephriticis doloribus: quam & cum successu usurpatam in duobus ægris calculosis testantur in literis eodem anno ad Societatem Indicam datis Gubernator & Supremus Batavorum Confessus in insula Ceylon, aiunt enim in iis deturbatas expulsaque fuisse multas arenulas, minutosque calculos absque ullo fere dolore.

Primus Nosocomii urbis Colombo, quæ sita est in memorata insula, Chirurgus, Vir, ut videtur industrius plane & diligens, in literis Anno 1699. ad me datis, in rei veritate testari se posse asserit, efficacius medicamentum contra calculum & Nephriticos dolores repertum hætenus non fuisse, qui & porro addit tres ejus species a se multa investigatione inventas quarum prima foliis amicitur dilute virentibus & semen producit itidem luteum: Secunda folia edit sature virentia & semen producit itidem luteum: Tertia semen nigrum profert & longe majoribus foliis vestitur quam reliquæ duæ, quas virtute præstantissimas esse asserit, denique subjungit fertilissimam esse hanc plantam, quæque plusquam decem millia feminum gignit. Hujus usurpantur folia, semen, quod præ cæteris partibus laudat præfectus ille noster Nosocomii Zeylanensis, Radix, caules & rami. Folia lecta antequam flores prodeunt, in umbra ficcata, & in pulverem comminuta dantur in convenienti vehiculo aut aquæ calidæ infunduntur, bibiturque ea infusio instar infusionis herbæ The. Infunduntur & Spir: vini & paratur per distillationem Spiritus ex Radice, caulibus & ramis. Flores, Radices, extractum, & Sal in Pleuritide Colica & Febribus feliciter se usurpasse testatur alius quidam Nosocomii Zeylonensis præfectus.

Atque hæc sunt, quæ mihi innotuere ex litteris Colombo ad Societatem nostram Indicam & ad me datis.

XI. The first that brought it into reputation was a Portuguese Surgeon, who having lived many Years in Brazil, discovered the Virtues of this Plant; after returning into Portugal with a design to raise a great Trade with it, he sent several Specimens of it every where. He called the Plant *Iquetaia*, and attributed to it no less Virtues than the cure of Apoplexies,

*A new Plant from Brasil, by Mons. Marchand. n. 278. p. 1103.*



*Apoplexies, Pleurifies and Intermittent Fevers.* He added one thing, which though more particular, yet seemed more probable, which was, that the Leaves, infus'd with *Senna*, took from it its disagreeable taste and smell without altering any thing of its *Purgative* quality. The *Samples* that he sent were not in sufficient quantity to make Experiment on the Distempers, he said, it was proper for; but there was enough to try whether they had the virtue to correct the taste and smell of *Senna*. Therefore there was infus'd two *Drams* of it with as much *Senna* in a *Chopine* of Water, and the Experiment confirmed the matter of Fact. Being desirous to know what *Species* of Plant it was, and it being impossible to discover it by the Leaves, the *Portuguese* Surgeon had taken so much care to cut them very small, Monsieur *Homburg*, who had some of it sent him, perceived some Seeds swimming on the Water, in which they were infus'd, and taking up as many as he could of these Seeds, gave them to Monsieur *Marchand*, who sowed them, from whence grew up a Plant, which (God be thanked) we need not go to *Brazil* to seek, it grows in *Europe*, nor need we go out of *France* to find it; nay more, we may have it all round *Paris*; 'tis the *Scrophularia aquatica*. [To be the more certain of it, there was some of our *Scrophularia* sowed on a Bed, and some of the other Seed on another, and there was observed but some small Differences, which may be well attributed to the different Culture and Soil. There was likewise tryed the Vertue of our *Scrophularia*, and it was found to have the same Effect, in taking away the Taste and Smell of *Senna*.

Of the Root of  
Pareira Brava,  
by Dr. Helve-  
tius, n. 346.  
p. 365.

XII. The *Pareira Brava* is a Root which comes to us from *Brazil* by the way of *Lisbon*, but which the War has rendred pretty scarce; however it is to be found among the good Druggists, and is sold at *Paris* for 40 *Livres* the Pound: 'tis call'd in *Brazil* the universal Medicine, and is made use of there in all kind of Distempers. A Capuchin Monk, who came from thence, told me that he could not give it a greater Character than by assuring me, that in all their Voyages they carryed the Gospel in one Pocket and the *Pareira Brava* in the other. Experience shews us that the *Pareira Brava* does abundantly provoke Urine, whence it will follow, That it will discharge by the Kidneys the corrosive Acidity of the Mass of Blood; it is also good to break and thin the pituitous and viscous Humours; and it cures the Suppressions of Urine occasion'd by Obstructions in the Kidneys. One may conclude from hence, that the Salts of the *Pareira Brava*, which are moderately Volatile, are proper to dissolve or separate the too thick and too close Texture of the Sulphur of the Lympha. Finally this Medicine has a light or gentle Bitterness which corrects the Acids of the Stomach, and renders them more pure and fine. Hence the Chyle becomes better digested and more Balsamick, and fitted to assimilate it self with the Blood, and to preserve therein that degree of Division and Fluidity which is necessary for it.



The Method of using this Root with Success, is to reduce it to an impalpable Powder, and to infuse thereof the weight of a Demi-gros in a Pint of boyling Water, and let it lye in it all Night, and next Morning boyl it one Moment. Then pour the Liquor off gently from the Powder, and take of it a Demi-setter in two Cups with a little Sugar as hot as Tea, putting into each Cup 5 Grains of the said Root reduced to an impalpable Powder, which you must stir with a Spoon, that none of it may remain at the Bottom. You may repeat the same Dose about 4 Hours after Dinner, but you must not eat any thing within an Hour after you have taken it. This Medicine does not oblige you to alter the ordinary course of your living; and you may continue the use of it several Months together, in which time also you may discontinue it two or three Days together at a time, if you please; but you should take some gentle Purge every Fortnight or Three Weeks during the use of the said Medicine.

Take eleven Grains of this Root, and put it into a Pewter Tea Pot filled with boyling Water, and so let it infuse all Night over warm Ashes, or a very small Fire; and in the Morning boyl it again, but very gently, till you use it; you must drink it just as you do Tea, and the Liquor which comes from that Infusion, must not exceed the Quantity of 5 small Dishes of Tea.

*Preparation of the Root.*

XIII. *Peru-Bark* comes from a Tree about the bigness of a Plumb-Tree, with Leaves like Ivy, but not quite so big, and are always green. The *Indians* call it *Querango*. 'Tis gather'd in *Autumn*, and the Rind taken off all round, as well from the Boughs as the Trees, which grows again in four Months as Cork does. The Trunk is about the Bigness of a Man's Thigh: It bears a Fruit not unlike a Chestnut, (except its outer Rind or Shell) which is properly call'd *China China*, and is esteem'd by the Natives above the Bark taken from the Trunk or Boughs. This Account I received from an ingenious Apothecary at *Cadiz* in *Spain*, A. D. 1694. who had liv'd in *Peru*, and seen it growing, and gather'd it several Times. From this History I made this Observation, that probably *China China*, or the Rind of the Fruit, was first only in Use, and the more powerful Medicine us'd in smaller Quantities, and that the Bark of the Tree came not into play till some time after; when the Virtues of it known in *Europe* occasion'd a greater Demand for it.

*Of the Jesuits Bark, by Dr. Will. Oliver, n. 290. p. 1596. com by Mr. Petiver.*

XIV. The Oil press'd out of the Walnut-Tree in certain Provinces, is us'd instead of Butter and Oil Olive. In *Berry*, where they have good Wool, and trade much in Cattle, the little Butter they have is worth nothing and very dear, so that they use Nut Oil in dressing their Meat to eat. For this Reason, there are an infinite number of Walnut-Trees planted in the middle of the plough'd-Lands, in such sort, that afar off one would take these Lands for Woods of Walnut-Trees.

*A new kind of Walnut Tree, by Mr. Re-neume, n. 273. p. 998.*



The last *Autumn*, I being gone to see one of my Kinsmen, who was at his Country House, two Leagues from *Selles* in *Berry*, in the Parish of *Lis*, as I walked in an Orchard looking upon some Plants, near a place where they bred up a vast number of young Walnut-trees, I perceiv'd in the middle, a sort of Leaf (or foliage) which I had never taken notice of before. I went thither forthwith (with much Eagerness) and having examin'd it, as I knew not the substance of this Leaf, I tasted it. The taste, smell, wood and figure of the Tree, perswaded me to believe that it was a Walnut-Tree, and I concluded that this was one, tho' I did not remember that I had ever read, or heard of any sort like this.

This Tree is very young, and did never yet bear any Fruit, perhaps, because it may be (*in a manner*) choak'd up, and that there is neither Air nor Nourishment enough, by reason of the great number of other Walnut-Trees, which grow round about it. It is near six Foot high, and two Inches Diameter at the bottom. 'Tis adorned at the top with many Branches, and (as the Country People said) was about eight or nine Years old, and that they had always found its Leaves like those which I saw. I cut off a little Branch of it, but having no Paper or Book with me, I cou'd not preserve the Leaves so well as I wish'd.

The (*common*) Walnut-Tree bears its Leaves by pairs, upon a Stalk which terminates with a like Leaf, that is ordinarily bigger than the rest: And it has very seldom above three pairs upon each stalk. This has sometimes four or five pairs, and sometimes more, which are one while opposite, another while alternate, although its Leaves appear smaller than those of the common Walnut-Tree, because of the Cuttings or *Slashes*. They are nevertheless as big, if one minds their Circumference taken from the Extremities of these *Slashes*.

The first Pair, and sometimes the second are less cut than the rest, being so only upon the Circumference: but the others are cut so deep, that it looks as if the Nerve in the middle of the Leaf was only a Stalk. And the *Cuts* of the Leaves are sometimes by Pairs, sometimes single on one side. These Leaves are sometimes forked at the end, and sometimes end with a point. There are also some places, where it looks as if the Leaf was torn on purpose, almost like the *Angelica Canadensis, foliis quasi præmorsis*. There are others, where it seems that they are double, as if the Stalk or the Nerve was winged, just as the winged Stems or Trunks, or *Caules alati*. All these Cuts and Slashes are not like Indentures or Notches, but finish with a Round. And notwithstanding all these Irregularities, they look so pretty, that I can't compare them better (*to any thing*) than those wrought Leaves, which serve for Ornaments to the Painters, almost like those which adorn the Capital of (*Columns of*) the *Corinthian* Order, or that which in Heraldry they call *the Mantles*, or that which the Botanists term *Acante* or *Branch Ursine*, which is the first original of this sort of Ornament.

I will add here, by the by, that *Dalechamp* has observ'd an aerial Honey of a yellowish Colour, upon the Leaves of a Walnut-Tree, during the



the greatest Heats of the Summer. Which can be nothing but an Effect of the Transpiration of the Tree, as of all other Trees, wherein the same thing is to be found.

XV. Towards the end of July 1709. we arrived at a Village not above four small Leagues distant from the Kingdom of Corea, which is inhabited by those *Tartars* called *Calca tatze*. One of these *Tartars* went and found upon the neighbouring Mountains four Plants of the *Gin-seng*, which he brought us entire in a Basket: I took one of them, and designed it, in its exact Dimensions as well as I could possibly do it; the Figure of which I here send you, and shall give you the Explanation of it at the end of this Letter. The most eminent Physicians in *China* have writ whole Volumes upon the Virtues and Qualities of this Plant; and make it an Ingredient in almost all Remedies which they give to their chief Nobility; for it is of too high a Price for the common People. They affirm, that it is a Sovereign Remedy for all Weaknesses occasion'd by excessive Fatigues either of Body or Mind; that it dissolves Puitous Humours; that it cures Weakness of the Lungs and the Pleurisy; that it stops Vomitings; that it strengthens the Stomach and helps the Appetite; that it disperses Fumes or Vapours; that it fortifies the Breast, and is a Remedy for short and weak Breathing; that it strengthens the vital Spirits, and increases Lymph in the Blood; in short, that it is good against Dizziness of the Head, and Dimness of Sight, and that it prolongs Life in old Age. No Body can imagine that the *Chinese* and *Tartars* would set so high a value upon this Root, if it did not constantly produce a good Effect. Those that are in Health often make use of it to render themselves more vigorous and strong: and I am perswaded that it would prove an excellent Medicine in the Hands of any *European* who understands Pharmacy, if he had but a sufficient quantity of it to make such Tryals as are necessary, to examine the nature of it Chymically, and to apply it in a proper quantity according to the Nature of the Disease for which it may be beneficial.

It is certain that it subtilizes, increases the Motion of, and warms the Blood; that it helps Digestion, and invigorates in a very sensible manner. After I had designed the Root, which I shall hereafter describe, I observed the state of my Pulse, and then took half of the Root, raw as it was and unprepar'd: In an Hour after I found my Pulse much fuller and quicker; I had an Appetite, and found my self much more vigorous, and could bear Labour much better and easier than before. Four Days after, finding my self so fatigued and weary, that I could scarce set on Horse back, a Mandarin who was in company with us perceiving it, gave me one of these Roots: I took half of it immediately, and an Hour after I was not the least sensible of any Weariness. I have often made use of it since, and always with the same Success. I have observed also, that the green Leaves, and especially the Fibrous part of them chewed, would produce nearly the same effect. The *Tartars* often bring us the



Leaves of *Gin-seng* instead of Tea; and I always find my self so well afterwards, that I should readily prefer them before the best Tea. Their Decoction is of a grateful Colour; and when one has taken it twice or thrice, its Taste and Smell become very pleasant.

As for the Root of this Plant, it is necessary to boyl it a little more than Tea, to allow time for extracting its Virtue; as is practised by the *Chinese* when they give it to sick Persons, on which occasion they seldom use more than the fifth part of an Ounce of the dried Root. But as for those that are in Health, and take it only for Prevention, or some slight Indisposition, I would advise them not to make less than ten Doses of an Ounce, and not to take of it every Day. It is prepared in this manner: The Root is to be cut into thin Slices, and put into an Earthen Pot well glazed, and filled with about a quarter of a Pint of Water, *Paris* Measure: The Pot must be well covered, and set to boyl over a gentle Fire; and when the Water is consumed to the quantity of a Cupfull, a little Sugar is to be mixt with it, and it is to be drank immediately. After this, as much more Water is to be put into the Pot upon the remainder, and to be boyled as before, to extract all the Juice and what remains of the spirituous part of the Root. These two Doses are to be taken, one in the Morning, and the other at Night.

As to the Places where this Root grows, it is between the thirty ninth and forty seventh Degree of Northern Latitude, and between the tenth and twentieth Degree of Eastern Longitude, reckoning from the Meridian of *Peking*. There is there a long Tract of Mountains, which the thick Forests, that cover and encompass them, render almost unpassable. It is upon the Declivities of these Mountains and in these thick Forests, upon the Banks of Torrents or about the Roots of Trees, and amidst a thousand other different sorts of Plants, that the *Gin-seng* is to be found. It is not to be met with in Plains, Vallies, Marshes, the bottoms of Rivulets, or in Places too much exposed and open. If the Forest take Fire and be consumed, this Plant does not appear till two or three Years after: It also lies hid from the Sun as much as possible; which shews that Heat is an Enemy to it. All which makes me believe, that if it is to be found in any other Country in the World, it may be particularly in *Canada*, where the Forests and Mountains, according to the relation of those that have lived there, very much resemble these here.

The Places where the *Gin-seng* grows are on every side separated from the Province of *Quan-tong* (which in our old Maps is called *Leaotum*) by a Barrier of wooden Stakes which incompasses this whole Province, and about which Guards continually patroll to hinder the *Chinese* from going out and looking after this Root. Yet how vigilant soever they are, their Greediness after Gain incites the *Chinese* to lurk about privately in these Deserts, sometimes to the number of two or three thousand, at the hazard of losing their Liberty and all the Fruit of their Labour, if they are taken either as they go out of or come into the Province.

The



1894





Fig. 1.

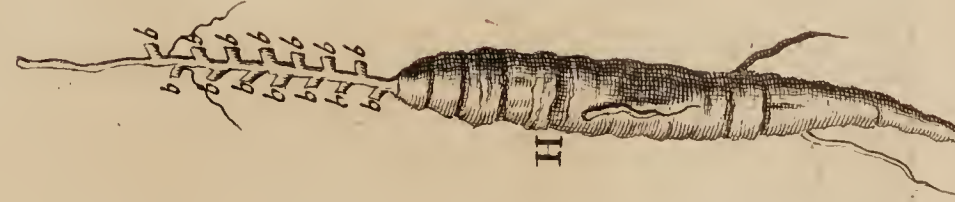


Fig. 2.

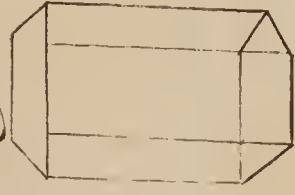


Fig. 3.



The plant in this Figure is reduced  
to half its Natural Size.



The Emperor having a mind that the *Tartars* should have the Advantage that is to be made of this Plant rather than the *Chinese*, gave Orders in 1709. to ten Thousand *Tartars* to go and gather all that they could of the *Gin-seng*, upon condition that each Person should give his Majesty two Ounces of the best, and that the rest should be paid for according to its weight in fine Silver. It was computed, that by this means the Emperor would get this Year about twenty thousand *Chinese* Pounds of it, which would not cost him above one fourth part of its value. We met by chance with some of these *Tartars* in the midst of those frightful Deserts: And their *Mandarins*, who were not far distant out of our way, came one after another, and offer'd us Oxen for our Subsistence, according to the Commands they had received from the Emperor.

This Army of Herbarists observed the following Order. After they had divided a certain Tract of Land among their several Companies; each Company, to the number of an hundred, spreads it self out in a strait Line to a certain fixt Place, every ten of them keeping at a distance from the rest. Then they searched carefully for the Plant, going on leisurely in the same Order; and in this manner in a certain number of Days, they run over the whole space of Ground appointed them. When the time is expired, the *Mandarins*, who are encamp'd with their Tents in such places as are proper for the subsistence of their Horses, send to view each Troop, to give them fresh Orders, and to inform themselves if their number is compleat. If any one of them is wanting, as it often happens, either by wandring out of the way, or being devoured by wild Beasts, they look for him a Day or two, and then return again to their Labour as before.

*A.* Shows the Root of the Plant; which when wash'd, was white, and a little rugged and uneven, as the Roots of other Plants generally are. Plate II.

*B. C. D.* represent the Length and Thickness of the Stalk; which is smooth and pretty round, of a deepish red colour, except near its beginning at *B.* where it is whiter, by reason of its nearness to the Ground.

*D.* is a sort of Knot or Joynt, made by the shooting out of four Branches, which all rise from the same Center, and divide one from another at equal distances at the same height from the Ground. The underside of the Branch is green, mixt with white; the upper part is much like the Stalk, of a deep red, inclining to the colour of a Mulberry. These two colours gradually decrease and unite together on the sides in a natural mixture. Each Branch has five Leaves, as represented in the Figure. It is remarkable, that these Branches separate from each other at equal distances, as well in respect of themselves, as of the Horizon, and make with their Leaves a circular Figure nearly parallel to the Surface of the Ground.

Tho' I have finish'd the design but of half of one of the Leaves at *F.* yet any one may easily conceive and perfect the rest in the same manner. I do not know that ever I saw Leaves so large as these that were



so thin and fine : Their Fibres are very distinguishable; and on the upper side they have some small whitish Hairs. The Skin between the Fibres rises a little in the middle above the level of the Fibres. The colour of the Leaf is a dark green above, and a shining whitish green underneath. All the Leaves are serrated, or very finely indented on the edges.

From *D.* the Center of the Branches, there rises a second Stalk *D. E.* which is very straight and smooth, and whitish from bottom to top, bearing a Bunch of round Fruit of a beautiful red colour. This Bunch was composed of twenty four Berries, two of which I have here drawn, marked *g. g.* The red Skin that covers the Berry is very thin and smooth: it contains within it a white softish Pulp. As these Berries were double (for they are sometimes found single) each of them had two rough Stones, separated from one another, of the size and figure of our common Lentils, excepting that the Stones have not a thin edge like Lentils, but are almost every where of an equal thickness. Each Berry was supported by a smooth, even, and very fine Sprig, of the colour of those of our small red Cherries. All these Sprigs rose from the same Center, and spreading exactly like the Rays of a Sphere they make the Bunch of Berries that they bear of a circular form. This Fruit is not good to eat. The Stone is like the Stones of other common Fruit; it is hard, and incloses a Kernel. It is always placed upon the same Plan or Level with the Sprig that bears the Berry. From whence it is, that the Berry is not round, but a little flat on each side. If it be double, there is a kind of Depression, or hollow place in the middle, where the two parts unite. It has also a small Beard at top, diametrically opposite to the Sprig on which it hangs. When the Berry is dry, there remains only a shrivel'd Skin that sticks close to the Stones, and is then of a dark red or almost black colour.

This Plant dyes away; and springs again every Year. The number of its Years may be known by the number of Stalks it has shot forth, of which there always remains some Mark; as may be seen in the Figure by the Letters *b. b. b.* &c. From whence it appears that the Root *A.* was seven Years old, and that the Root *H.* was fifteen.

There are some Plants, which beside the Bunch of Berries I have described, have also one or two Berries like the former, placed an Inch or an Inch and a half below the Bunch. And when this happens, they say, if any one takes notice of the point of the Compass that these Berries direct to, he can't fail of finding the Plant at some Paces distant that way, or thereabouts. The colour of the Berries, when the Plant has any, distinguishes it from all others, and makes it remarkable at first Sight: But it sometimes happens that it bears none, though the Root be very old; as that marked by the Letter *H.* had no Fruit, though it was in its fifteenth Year.

They having sowed the Seed in vain, without its producing any Plant, might probably give occasion to this Story, which is current among the

*Tartars.*



*Tartars.* They say that a Bird eats it as soon as it is in the Earth, and not being able to digest it, it is purified in its Stomach, and afterwards springs up in the place where it is left by the Bird with its Dung. I rather believe that the Stone remains a long time in the Ground before it shoots out any Root. And this Opinion of mine seems the more probable, because there are found some Roots, which are not longer and not so big as ones little Finger, tho' they have shot forth successively at least ten Stalks in as many different Years.

Tho' the Plant I have here described had four Branches, yet there are some that have but two, others but three, and some that have five or seven; which last are the most beautiful: Yet every Branch has always five Leaves, as well as this here figured, unless the number has been diminished by any Accident. The Height of the Plants is proportionable to their Bigness and the number of their Branches. Those that bear no Fruit are commonly small and very low. The Root, the larger and more uniform it is, and the fewer small Strings or Fibres it has, is always the better: On which account that marked with the Letter *H.* is preferable to the other. I know not for what reason the *Chinese* call it *Ginseng*, which signifies *the Representation or Form of Man*: Neither I myself, nor others who have inquired into it could ever find it had any resemblance to the Signification of its Name. The *Tartars* with more reason call it *Orhota*, which signifies *the Chief of Plants*. Those that gather this Plant preserve only the Root, and bury together in some certain place in the Earth all that they can get of it in ten or fifteen Days time. They take care to wash it well, and cleanse it with a Brush from all extraneous Matter. Then they dip it into scalding Water, and prepare it in the fume of a sort of yellow Millet, which communicates to it part of its Colour. The Millet is put into a Vessel with a little Water, and boils over a gentle Fire; the Roots are laid upon small transverse pieces of Wood over the Vessel, and are thus prepared, being covered with a Linnen Cloath or some other Vessel placed over them. They may also be dried in the Sun, or by the Fire; but then, though they retain their Virtue well enough, they have not that yellow Colour which the *Chinese* so much admire. When the Roots are dried, they must be kept close in some very dry Place; otherwise they are in danger of corrupting, or being eaten by Worms.

XVI. *Araliastrum* is a Genus of Plants, whose Flower *A* \* is complete †, regular, polypetalous, and hermaphrodite, standing on the Ovary *B.* The Ovary, which is crown'd by a Calyx cut into several parts, becomes a Berry *D.* in which are, for the most part, two flat Seeds like a Semicircle, which both together represent a sort of a Heart. Add to this the Stalk, which is single, ending in an Umbel of which each Ray bears but one Flower. Above the middle of the Stalk come

*A new Genus of Plants, of which the foregoing is a Species, com. by Dr. Sherrard, n. 354. p. 703.*

\* *vid.* *Aralia Inst. rei herb.* Tab. 154. † Complete, that is to say, that has a Calyx.



out several *Pedicles*, (as on that of the *Anemone*) on the Extremities of which grow several Leaves like Rays, or like an open Hand. The Species of this Genus are,

1. *Araliastrum Quinquefolii folio, majus, Nin-zin vocatum* D. Sarrazin. *Gin-seng*. Des lettres edifiantes & curieuses, Tom. X. pag. 172.

2. *Araliastrum Quinquefolii folio, minus.* D. Sarrazin. *Plantula Marilandica, foliis in summo caule ternis, quorum unumquodque quinquesariam dividitur, circa margines serratis.* N° 36. Raii Hist. III. 658.

3. *Araliastrum Fragrariæ folio, minus.* D. Vaillant. *Nasturtium Marianum Anemones sylvaticæ foliis, enneaphyllon, floribus exiguis.* Pluk. Mantiff. 135. Tab. 435. Fig. 7.

To shew wherein *Araliastrum* differs from *Aralia*, (from whence it takes its Name) 'tis convenient to give also the Character of this last Genus, such as Mr. *Vaillant* establish'd it, in his Demonstrations of the Year 1717.

*Aralia* \* is altogether like the *Araliastrum*, as to the Structure and Situation of its Flower; but its Berry consists of five Seeds plac'd round an *Axis*. Moreover, its Leaves are branched, almost like those of *Angelica*; and its Stalks (which in some Species are naked, and in others have Leaves set alternately) bear each several Umbels at their top, in the Form of a Bunch of Grapes. The Species of *Aralia*, are,

\* vid. *Inst. rei*  
*Herb.* 300.  
*Tab.* 154.

1. *Aralia caule aphylo, radice repente.* D. Sarrazin. *Christophoriana Virginiana Zarzæ radicibus surculosis & fungosis, Sarsaparilla nostratibus dicta.* Pluk. Almag. 98. Tab. 238. Fig. 5. *Zarsaparilla Virginienfis nostratibus dicta, lobatis umbelliferæ foliis, Americana.* Ejusd. Almag. 396.

2. *Aralia caule folioso lævi,* D. Sarazzin. *Aralia Canadensis.* *Inst. rei Herb.* 300.

3. *Aralia caule folioso & hispido,* D. Sarazzin.

4. *Aralia arborescens spinosa,* D. Vaillant. *Angelica arborescens, spinosa, seu Arbor Indica, Fraxini folio, cortice spinoso.* Raii Hist. II. 1798. *Christophoriana arbor aculeata Virginienfis* Pluk. Almag. 98. Tab. 2c.

All the Species of these two Genera, except the last of each of them, are common in *Canada*. The Inhabitants of that Colony, and those of *Virginia*, call the first Species of *Aralia* by the Name of *Sarsaparilla*, because its Roots have almost the same Figure and Vertues. Mr. *Sarrazin* writes from thence, that he had a Patient who had been cured of an *Anasarca*, about two Years before, by the use of a Drink made of these Roots, and assures us, That the Roots of the second Species, well boyl'd and apply'd by way of *Cataplasme*, are very excellent for the curing of old Ulcers; as also the Decoction of them, with which they bath and syringe the Wounds. He does not at all doubt, but the Vertues of the third Species (which I shall briefly describe) are the same with those of the second.

Its Roots creep, and send forth Stalks, which rise commonly to the height of a Foot and half, and sometimes to two Foot; the bottom part of



of them is rough, with reddish, stiff and prickling Hairs. These Stalks are set from the bottom to almost the top (which are divided successively into several naked Branches charg'd with Umbels) with branch'd alternate Leaves, almost like those of *Podagraria hirsuta Angelicæ folio* & odore D. Vaillant; which Plant is grav'd in the second Tome of Boccone's *Musæum*, by the Name of *Cerefolium rugoso Angelicæ folio, Aromaticum*, Tab. 19. and in Rivini by that of *Myrrhis folia Podagrariæ*.

XVII. The whole Plant is of a straw Colour, and much of the big-  
ness the *Figure* represents it. The Stems are hollow, and fill'd with a An unde-  
scrib'd Plant  
in Merioneth-  
shire, by Mr.  
Lhwyd, n. 337.  
p. 275. kind of thick reddish Liquor, as much like Blood [or Gore] as the  
Juice of Plants, insomuch that it seems referrable to the Zoophyts. If  
you press these Stems at the bottom, between your Fingers, the red Li-  
quor is forc'd up, and causes the drooping Flowers [or Seed Vessels] to  
mount erect.

XVIII. I have had reason to give a great Character of Sugar, on ac-  
count of some extraordinary Effects it seem'd to have on my Grand-  
father forty Years since. He made it his daily practice to take or lick Observations on  
the Vertues and  
Properties of  
Sugar, by Dr.  
Stare. n. 337.  
p. 273. up as much Sugar as his Butter spread upon Bread would receive, for his  
constant Breakfast, unless he happened to exchange it for Honey some-  
times. He frequently sweetned his Ale and Beer with Sugar: He had  
Sugar put to all the Sauces he used with his Meat. He had all his Teeth  
in his Mouth at 80 Years, strong and firm; never had any Pain or Sore-  
ness in his Gums, or Teeth; never refused the hardest Crust. In his  
82d Year one of his Teeth dropt out, and soon after that a second, which  
he put into my Hand, and was one of the fore-Teeth: He bid me feel  
the Cavity, where I struck my Nail upon a Bone. In short, all his  
Teeth came out in two or three Years, and the young ones filled up  
their room: He had a new Set quite round. His Hair from a very can-  
did white became much darker. He continued in good Health and  
Strength, without any Disease, and dy'd in his 99th or 100th Year, of  
a *Plethora*, as I guess, for want of bleeding. He was a *Bedfordshire*  
Gentleman of an old *English* Family; and the Case well known. This  
reconcil'd me much to vindicate Sugar, which I have done formerly be-  
fore the *Royal Society*; and have shewn the unjust Calumny of the fa-  
mous *Willis* against Sugar, who charges it with a Corrosive Liquor, as  
bad as *Aqua fortis*; He calls it *Aqua Stygia*. I examined it, and found  
the Charge unjust; that Sugar contain'd no worse substance in it, than  
Milk and Honey, and *Manna*, nay even Bread it self. The Experi-  
ments were approv'd of, and are in your Journals.

Some Years past I shew'd Dr. *Lister* the Figure that Sugar did natu-  
rally make, or shoot into, and would have had him describe it, and add  
it to those curious Cuts of Salts before his Book of Mineral Fountains;  
but we could not then well express the Figure, which I have since been  
able



able to do more accurately. For the difficulty lies here; all other Salts shoot or crystallize, and make their Figure in a cool Place; but Sugar will crystallize only in a hot Stove, and is more apt to be compounded, and not to shew its true primitive Texture. Thus it happens to Snow, which in its true simple shape is an Hexagon; but cannot be always discover'd single. This is yet more easy to be accounted for than Snow; and we have been able to chuse such parcels of that Sugar call'd Candy, as do represent the following Figure, being a Prism, as you may see by the Figure. I never question'd but that it was a true Salt, having all the Properties of a Salt; and therefore made many unsuccessful Experiments before my Acquaintance with Sugar Bakers.

Plate LI.

Fig. 2. Shews the Form of the Crystals or Salts of Sugar, having two Bases, opposite, equal, and parallel; the other are Parallelogramms.

Fig. 3. Shews the Basis of the preceeding Figure.

American  
Plants, by Dr.  
Mather, n. 339  
p. 62.

XIX. *Antierisypelas*, a Plant efficacious in curing Inflammations; it grows plentifully in the Woods: A Chymical Oyl extracted from it, taken inwardly, does Wonders in absorbing Scorbutick Salts. Another Plant, which goes by the Name of Partridge Berries, excellent in curing the Dropsy; a Decoction of the Leaves being drank several Days as a Tea, discharges a vast Quantity of Urine, as long as the Disease lasts: after which it may be drank without provoking Urine observably. Gouty Persons drink it with Benefit.

A Root call'd the bleeding Root, curing the Jaundice in 5 or 6 Days.

Another call'd the Cancer Root, and a sort of Devil's Bit, and a Thistle, call'd the Boars Thistle; a Decoction of these 3 Roots is a Cure for the King's Evil, though very far gone, a small quantity being drank every Day; and the bruis'd Roots applied to the scrophulous Tumors.

A Plant call'd by the Indians *Tantuttipang*, infallible for the *Lues Venerea*, the Root being us'd in a Decoction, and drank half a Pint; a Cataplasm of the same sort bruis'd, apply'd to the Ulcers, cures them also.

Of the sinking  
of Three Oaks  
into the Ground,  
com. by Peter  
Le Neve, Esq;  
n. 355. p. 766

XX. July 23. 1717. near the Seat of Sir Charles Potts, Bar. in Norfolk, in the Parish of Manington, (about Midway between Holt and Aylsham, and about 7 Miles from the Coast near Cromer) in the Day-time: first, one single Oak, with the Roots and Ground about it, was seen to subside and sink into the Earth; and not long after, about forty Yards distance, two Oaks that were contiguous, sunk after the same manner into a much larger Pit, being about 33 Foot Diameter, whereas the former is not fully 18. These as they sunk fell across, so that obstructing each other, only the Roots of one of them reaches the bottom, whereas the first stands perpendicular. When the first Tree sunk, it was observed, that the Water boyl'd up in the Hole; but upon the sinking of the greater Pit, that Water drain'd off into it, from the former, which now continues dry. The depth thereof to the firm bottom is nine Foot



Foot three Inches; and the Tree that stands upright in it, is three Foot eight Inches in Girt, and its Trunk about 18 Foot long, half of which is now within the Pit. In the bottom of the greater Pit, there is a Pool of Water about 8 Foot Diameter; whose Surface is 11 Foot three Inches below the Ground, and the Trees that are in this Pit, are much of the same length with the other, but somewhat smaller, the one being in Girt 3 Foot 5 Inches, the other but two Foot 9 Inches. The Soil on which these Trees grew, is gravelly; but the bottom is a Quick-sand over a Clay, upon which there are Springs, which feed large Ponds adjoining to Sir Charles Potts's House, at about a quarter of a Mile from these Holes.

The Nature of the Soil seems to afford us a reasonable conjecture at the Cause of this odd Accident, which some perhaps may be apt to reckon as a Prodigy. The Springs running over the Clay at the bottom of a Bed of very minute Sand, such as your Quick-sands usually are, may reasonably be supposed in many Ages to have washed away the Sand, and to have thereby excavated a kind of subterraneous Lake, over which these Trees grew: And the force of the Winds, on their Leaves and Branches, agitating their Roots, may well have loosened the Sand under them, and occasioned it to fall in, more frequently than elsewhere; whereby in length of time the thin Bed of Gravel being only left, it might become unable to support its own weight and that of the Trees it bore. That this is not a bare Conjecture, may appear from the boiling up of the Water at first in the lesser Hole, and its standing in the bigger and lower. And if it shall be found that it was a very windy Day whereon this Accident happen'd, it will much add to the probability of this Solution.

An Accident not unlike this lately happened in *Fleetstreet, London*, A like sinking of the Earth in London, *ibid.* by the defect of the arched Roof of a very deep Common-Sewer. The Earth gradually falling into the Sewer, was carried away by it, so as not to obstruct the Water; and the continual Tremour of the Ground, occasioned by the constant passing of Carts and Coaches, by degrees shook down the Earth, so as to leave a very great Cavern, the top whereof at length grew so very thin, that one Day a weighty Cart having just past it, a great space of the Pavement sunk in, in the middle of the Street, not without hazard to a Coach then driving by.

XXI. *Papers Omitted.*

1. Father *Camelli de Plantis Philippensibus Scandentibus*, sent very lately to Mr. *James Petiver*, F.R.S. to which is added a Catalogue of Herbs he formerly sent him, the Designs of which are already describ'd, by that most eminent Botanist Mr. *John Ray*, in the Appendix to his Third Volume of *Plants*. n. 293.p.1707

2. A Second Part of the same. n. 294.p.1763.



- n. 295 p. 1809. 3. A Third Part of the same.
- n. 296 p. 1816. 4. A Fourth Part.
- n. 336. p. 527. 5. An Extract of a Letter from the late Mr. *Edward Lhwyd*, to Doctor *Tancred Robinson*, giving an Account of some uncommon Plants growing about *Penzance* and *St. Ives* in *Cornwall*.
- n. 332. p. 375. 6. An Account of several rare Plants, lately observ'd in several  
n. 333. p. 416. curious Gardens about *London*, and particularly the Company of *Apo-*  
n. 343. p. 229. *thecary's* Physick Garden at *Chelsea*, by Mr. *James Petiver*, F. R. S.  
n. 344 p. 269. in Seven Tracts.
- n. 337. p. 31. 7. An Account of Mr. *Sam. Browne's* Third Book of *East-India* Plants,  
177. n. 346. with their Names, Virtues, Descriptions, by *James Petiver*; to which  
p. 353. are added some Animals sent him from those Parts.
- n. 271. p. 843. 8. An Account of the Fourth Book.
- n. 274. p. 933. 9. An Account of the Fifth Book.
- n. 276. p. 1007. 10. The Sixth Book.
- n. 277. p. 1055. 11. An Account of the Seventh Book.
- n. 282. p. 1251. 12. The Eighth Book.
- n. 287. p. 1450.

## XXII. Accounts of Books Omitted.

- n. 285. p. 1411. 1. *Gazophylacii Naturæ & Artis Decas I. In qua Animalia, Quadru-*  
*peda, Aves, Pisces, Reptilia, Insecta, Vegetabilia; item Fossilia, Cor-*  
*pora Marina, & stirpes Minerales e Terra eruta, Lapides figura in-*  
*signes, &c. Descriptionibus brevibus & Iconibus illustrantur. Hisce*  
*annexa est Supellex Antiquaria, Numismata, Gemmæ excisæ & Sculp-*  
*turæ, Opera Figulinæ, Lucernæ, Urnæ, Instrumenta varia, Inscriptio-*  
*nes, Busta, reliquaque ad rem priscam spectantia. Item Machinæ, Ef-*  
*figies Clarorum Virorum, omniaque arte producta. A Jacobo Petiver,*  
*R. S. S.*
- n. 331. p. 342. 2. An Account of the remaining part of the first Volume, by Mr. *Petiver*.
- n. 310. p. 2442. 3. The whole Art of Husbandry, by *John Mortimer*, Elq; 8vo.
- n. 325. p. 35. 4. Index Plantarum Horti Lugduno-Batavi. per *Herman Bærhaven*.  
Lugd. Bat. 1710. 8vo.
- n. 345. p. 350. 5. *Lud. Ferd. Marsilii Dissertatio de Generatione Fungorum, Romæ,*  
1714. 8vo.



## C H A P. VI.

## Zoology.

**A**LL the Natives within 20 Miles from the Sea Coast betwixt *Matura* and *Negumbo* are subject to the *Hollanders*, and know the Duty and Service which their *East India* Company requires of them; therefore when Orders are given to hunt the Elephants, they pitch upon a convenient place for a Warren or Park, which is broad at the Entrance, and turn the farther in the more narrow, so that at the end it is so narrow that an Elephant cannot turn himself; yet this narrow place is so long, that 20 Elephants may stand one behind another. The Park being perfected, the *Koolrale*, who is the Head or Chief of the *Kool* (which is to say in *English* a Shire) does order the Inhabitants who dwell thereabout to their places, who make a Circumference about the Woods, where they know that Elephants are, which will be the length of 60 *English* Miles. At first one Man stands from another at the distance of about 5 Poles, or 25 Yards, and kindles Fire in the Spaces between them, then by shooting, crying, beating of Drums, soundings of Horns, the Elephants retire towards the Park, and so from time to time the Men follow, shooting and making a Noise, until the Circumference be so little, that they stand upon one anothers side. The Elephants, when they find themselves inclosed within the Park, make more Resistance, some turning back upon the Men, but Posts are ready standing betwixt the Men and the Elephants, and long Stakes lying upon the Ground; they have only to lift these Stakes, and make the ends of these Stakes fast to the Posts, and thus the Elephants are enclosed within the Park. Then by following the Elephants, and casting of Firebrands, they chase them still farther toward the end of the Park, and closing up the Passage behind them, by setting up, and laying Stakes athwart the Posts, until at last they are all entered into the narrow place, where they cannot turn themselves. But because there are many sorts of Elephants, some being a great deal higher before than behind, and many who never have the two long Teeth; others are of a more savage Nature, which are known by their Eyes and Face, having a fierce Tyger-look, and will be for no Service, although they be kept 10 Years: Such ones the King of *Candie* keeps for punishing of Transgressors, for they kill all Persons that come within their reach.

One of them the late King of *Candie* sent to the *Hollanders* when I was there, in recompence of some Presents, which the *Hollanders* had sent to move him to Peace; among which Presents a Lyon from the *Cape of Good Hope* was sent, as being the King of all other Beasts, but he never would let these Presents come within 20

I.  
Of the taking  
and taming  
Elephants in  
Zeylan, by  
Mr. Strachan  
n. 277. p. 1051.



Miles of his Presence. The *Hollanders* kept the same Elephant in a place by himself still tyed, being at great Pains every Day to bring him to the Waterside betwixt two tame Elephants, the *Hollanders* intending to shew the regard they had to that King's Gifts. Such like Elephants being among the other Elephants in the fore-mentioned Park, are kept out of the narrow Entrance by casting Firebrands upon them when they draw near the narrow Entrance, and endeavour to kill them by Guns, and cutting off their Snout, by which they take all their Victuals; which being cut, they perish for hunger when they are escaped, for the Natives being very swift, will come very near them with their Swords. When all the choice of the Elephants are entered into the narrow Passage, there are several Posts put athwart, to prevent any of them from coming back; the rest that are not fit for Service have liberty to escape.

It is easie to conceive how the Natives did invent the chasing Elephants by Drums and Noise, because it is observed that they themselves are affrighted by Drums. I did hear an ancient *Portuguese* relating, That when his Country-men were in Possession of this Island, they did pursue the Natives too far among the Woods and Hills, the *Ceiloneses* by this means got the advantage of the *Portuguese*, and killed every one Man of them except one Drummer, who did observe them not to draw near where they did hear the Drum, he therefore beat upon his Drum continually; the *Ceiloneses* thinking that the greatest Power was where the Drum did beat, did not come near him, and by this means he saved his Life.

When the Elephants have been a while settled in the narrow Passage, they are one by one taken to the Stable, being tyed fast between two tame Elephants bred for that purpose, the point of whose long Teeth are cut: If the wild Elephant be troublesome, they will hold his Trunk with their Trunk, and beat him with their Teeth, a Man sitting upon each of the tame Elephants, to direct them by a Staff, upon the end of which is a little Hook, wherewith he touches his Head, and orders the tame Elephant as he pleases, without a Bridle or the like. When they come into the Stable, they are led betwixt two Posts, and Stakes put athwart before their Breasts and under their Bellies, and so tyed that they cannot stir, nor lye down upon the Ground; for if they should be permitted to lye down, they would turn heavy, sorrowful, and would not eat, and dye. They are this way fed and nourished with the Trunk of *Waltugas*, or *Plantains*. The Trunk of this Tree they love better than any other Food, and with these Trunks they are fed in the Ships; when they have been nourisht so for Six Weeks they begin to be tractable, and are fastened only with one Foot tyed with Cords; and if the Merchants come from *Bengal*, they are sold and convey'd to the Ships; if the Merchants have no use for them, or that they cannot agree about the Price, they feed them with Leaves of the *Coco Tree*, until 12 Weeks be



be past after their being taken, and then they are as tame as a Dog, and eat Grass with the Oxen in the Fields.

When the Elephants are put on board the Ships, there is a thing prepar'd of 15 or 20 double Sailcloth, which is laid about his Breast, Belly and Sides, and is tyed together upon his Back, whereunto Ropes are fastened, then he is led into the Water betwixt Elephants bred for the purpose, upon which a Man sits to govern him, and another Elephant (upon which sits a Man) goes behind the Elephant that is to be shipp'd, and when this Elephant is unwilling to enter the Water, the Elephant that is behind, puts his Head to the foremost's hinder parts, and presses him forward, which will cause any Person to laugh to behold the same; when he is got deep enough in the Water he is tyed to the Boat, the other Elephants return, and he swims after the Boat to the Ship, where he is haled over into the Ship.

But there is lately invented a more convenient way, which is this: There is prepared a big Vessel, flat bottom'd, cover'd with Planks like a Floor, so that this Floor is almost of the height of the Key; then the side of the Key and the Vessel are adorned with green Branches, so that the Elephant does see no Water till he be in the Ship.

When one Elephant swims to the Ship, or otherwise crosses a deep River, nothing of him can be seen only his Snout thorough which he breathes: and when he is washed upon a River side, he ordinarily lyes with his Head upon the bottom of the Water flat alike with his Body, and although one side of him be above Water, his Head will be under, holding only his Snout above Water, through which he breathes.

When the Elephants are tame, they are very docil and tractable, so that they will lye upon their Belly when Men are to get up and ride upon them.

If they fall at any time, although upon even Ground, they either dye immediately, or languish after that until they dye: their Body being of so great a bulk, is the cause of the harm they get by a fall.

If an Elephant frequents a Plantation of Fruit-Trees of the Natives, for no Hedges can keep him out, they make a point upon a heavy piece of Wood, and hang it on a Branch of a Tree under which the Elephant uses to come; and at Night a Man sits watching upon that Branch, and when the Elephant comes under the Branch, the Man cuts the Cord, and so the point of the Wood falls a Foot deep in his Back, by which means the Elephant languishes and dyes; but when the *Hollanders* get intelligence hereof, they are punish'd severely.

II. The *Auris Externus* of this big Creature lyes flat, and not Protuberant as in other Quadrupeds, whose Cartilaginous Substance is capable of divers Motions performed by several Muscles, whereby the inner Ear is preserv'd from the great Violence of the external Air, which upon some Occasions might perhaps injure or break the thin and delicate Membrane of the *Tympanum*. It is also for this reason that the *Meatus*

*Of the Organ of Hearing in the Elephant, by Dr. Blair, n. 358. p. 886.*

is



is further guarded, by the Contortions and oblique Position of the Cartilage at the Orifice of the *Meatus*, which only admits of a determinate quantity of Air, sufficient for the Vibration of the *Membrana Tympani*, by which a distinct Sound is convey'd to the *Sensorium commune*; whereas did the Air admitted exceed its due Proportion, nothing but the confus'd Idea of a Sound would follow, such as resemble the rushing of Waters, &c. or that Noise often observ'd when, by a supervenient Cold or the like, Obstructions are generated within the Ear it self. And in Men, because the *Auris externus* is also flat, not only are these Turnings and Windings observable in the Cartilage at the Entry, but the *Meatus* it self is likewise obliquely situated, to prevent the aforesaid Inconveniencies. But there is no need for such a Contrivance in the *Elephant*, whose external Orifice of the *Meatus* is patulent, open (scarce being guarded by the Cartilage) and streight, whose length (it reaching from the external to the internal Table of the Scull) is sufficient to prevent the Accession of too great a quantity of Air to the *Tympanum*; for in its Progress most of the *Columnæ Aeris* beat against one or other of the sides of the *Meatus*, in so much that their force is inhibited, and only so many as suffice to convey the Sound, can reach the *Tympanum* it self.

The *Meatus Auditorius* then is a long streight Tube or *Canule* situated Horizontally, and reaching from the outer to the inner Table of the Scull, in Figure not unlike the Barrel of a Pistol, but somewhat Oval, the sides of whose Cavity are hard and solid, about the thickness of a Half-penny, from whose outer part several of the *Laminae* betwixt the two Tables of the Scull do arise, (Fig. I.) Its Cavity is an Inch or  $\frac{3}{4}$  of an Inch Diameter, and length  $9\frac{1}{2}$  Inches; being somewhat enlarg'd as it arrives at the *Crena* for the *Membrana Tympani*, (Fig. 2.)

This *Crena* is two Inches in Circumference, within which is the *Cavitas Tympani*, consisting of two different Surfaces; the one much deeper and cellulous, the other more superficial and smooth. The first runs perpendicularly down  $\frac{1}{2}$  Inch from the *Crena Tympani*. Its bottom is variously divided into several *Cellules*, not unlike a Honey-Comb, but irregularly dispos'd. Its bony *Laminae*, by which these *Cellules* are distinguish'd from each other, are thicker at the top than the bottom, they being one Line, two Lines, or  $1\frac{1}{2}$  Line distant from each other, and about  $\frac{1}{4}$  Inch deep. Could I have got it so well cleans'd as I wish'd for, doubtless I might have observ'd their Communication with each other, by means of certain Orifices which serve to convey what superfluous Moisture is contain'd in them; for we may reasonably suppose, as in all other Cavities of the Body, there are certain Glands for separating proper Liquors convenient for the uses designed; so here there seems to be a necessity for separating a certain quantity of moisture, fit to lubricate the Muscles of the Ossicles, and facilitate their Motion; as also to preserve the *Membrana Tympani* from becoming too dry. This dryness of the *Membrana Tympani*, and the thickness of the Liquor separated



parated by these Glands, is often the cause of a Deafness in humane Subjects; especially those that are advanc'd in Age. This cellulous Structure of the *Cavitas Tympani* seems to be very proper for receiving of the superfluous Humidity; and these Communications are requisite for conveying it from one Cellule to another, till it is empty'd into the *Receptaculum Commune* the *Aqueduct*, whereof hereafter.

This first or cellulous Cavity is two Inches broad, and reaches from the *Crena Tympani* to the *foramen Ovale*, or entry into the *Vestibulum*, which is shut by the *Stapes*. The second part of this Cavity is more superficial (*Fig. 2. (e)*), in form not unlike a Pear, from a narrow beginning becoming broader and more superficial, terminating semicircularly, smooth in the Bottom, and having several incurvated Lines running across it; it reaches much farther than the *Vestibulum*, being one Inch five Lines from before to behind, and one Inch transversely where broadest. What superfluous Moisture it contains is discharg'd into the fore-named *Aqueduct*.

Beside the above-mentioned uses for these two Cavities, *viz.* to receive and discharge the superfluous Moisture; they are also most beneficial and assisting to the Hearing: for, no sooner is the external Air modulated, and the *Membrana Tympani* mov'd thereby, than the Sound is conveyed by the *Ossicles* to the *Nervus Auditorius*, and the Undulation continued, first by the *Anfractuosities* of the first Cavity, and then by the *Gyres* and incurvated Lines of the second, so that we may easily account for the acute Sensation of Hearing, wherewith *Elephants* are said to be endow'd: For as the tame ones are most exact in obeying their Masters Commands; so the wild ones are soon aware of what Traps or Snares are laid to catch them, by the tremulous Motion convey'd to their Ear from the cavous parts of the Earth, where the Pit into which it is expected they should fall, is digg'd. It is easy therefore to explain whence the Acuteness of the Sensation of this Animal may proceed; for as the *Nervus Olfactorius* has a large Space and Bounds wherein to be dispers'd, *viz.* the two Cavities of the *Proboscis*, which are both long and large, so that scarce any *Columna aeris* can enter them, but some one or another of the Filaments of the *Nervus Olfactorius* dispers'd in these Cavities must be toucht, whereby the Idea of smelling must be conveyed to the *Sensorium commune* in a more intense Degree, and the Animal soon become sensible of whatever approaches that is noxious or nauseous to it, and thereby is taught how to avoid it; so this Structure, for a quick Conveyance and long Continuance of the Sound, is a great means both to make the *Elephant* soon receive the Sound and have a deep Impression of it.

The *Aqueduct* is a flat Tube or Pipe, whose Orifice is so situated betwixt the two forementioned Cavities, that if there be any superfluous Humidity contained in them, it must needs be discharged (at least in this Animal) into the Mouth; for as it is situated where the first Cavity terminates, so the second, from a broader and more superficial beginning,



ning must needs discharge its Moisture, by its more narrow and deeper Termination, into this Receptacle; also it descends directly towards the Mouth, passing through the Scull below the hole for the Jugular Vein (*m m*) betwixt the hole for the *Carotid* Artery, (*p p*) and that for the *Arteria dura matris* (*q q*) whence descending (*n n*) it is joyn'd with its fleshy part, which discharges it self into the Mouth on each side, behind the back part of the inner Teeth of the upper Jaw. This Situation of the Aqueduct makes it plainly appear, that its Use is to receive the superfluous moisture from the *Cavitas Tympani*; for beside the Glands above-mentioned, fit for separating such a quantity of Humidity as may lubricate the Muscles, and facilitate both their Motion and that of the *Officles*; the very Vapours that arise in such a Cavity as that of the *Tympanum* in this Animal, must at last be converted into a Liquor, and that must either again be receiv'd into the Blood Vessels, or otherwise discharg'd by such a Receptacle as this. Further, if there be a necessity for Glands in the *Meatus Auditorius* without the *Tympanum*, to separate a certain Liquor, by which the acrimonious Particles of the Air are obtunded, and hindered from being offensive to the Nervous Membrane of the *Tympanum*, (which must be of a most acute Sensation) and for moistning it, by which it the more easily receives the Vibration of the Air; so such Glands as these seem to be most requisite in the *Cavitas Tympani* for the Uses above nam'd. And since what super-abounds of this moisture cannot be discharg'd outwardly as that of the *Meatus*, this Aqueduct seems to be most convenient for that purpose. Some are of opinion that this Aqueduct is also assisting to the Hearing, especially in Men; because it is generally observ'd that they who are Deaf, open their Mouths wide, when they are desirous to hear more distinctly: But I see not how that can be, for tho' the Cavity of the bony part of the Aqueduct, in most of Animals, is proportionally large enough; yet its carious or fleshy Part lyes for the most part so flat, and its two sides are so collaps'd together, that scarce any Air can be admitted, at least so far as to be subservient to the Hearing.

The *Officles* in this as in other Animals are three or rather four in number; for though I did not procure the *Os quadrangulare* of *Du Verney*, yet I have good reason to believe it was there; because there is a conspicuous *Sinus* in the Extremity both of the *Incus* and *Stapes*, where they are articulated, so big as to contain the Head of an ordinary Pin; and when I consider the Angle which must have been form'd by the Articulation of these two Bones, I look upon this small Bone to serve for the same purposes as the *Patella* in the Knee, and *Sesamoide* Bones in the Fingers and Toes.

The *Malleolus* is an irregular Bone, and doubtless has been endow'd with pretty large Muscles, because of the rugosities, protuberances and *Sinus's* observable in it. It has a protuberant Head (*Fig. 4. (1.)* four Lines broad, next to that a *Crena* or semicircular *Sinus*, (*2.*) after which the Bone is rais'd, affording a protuberant Margin to an oblong

*Sinus*



*Sinus* (3) for receiving the Head of the *Incus*, 4 Lines broad. The opposite part of this *Sinus*, or back part of the Bone, is convex, of an unequal rugose Surface, with a great many Protuberances and Depressions, for the Origins and Insertions of the Muscles, for the space of 5 Lines; where it forms an Angle, from whence it becomes flat and smooth, being 3 Lines broad and reaching four Lines to another Angle (5.) where the *Manubrium Malleoli* begins, and where it becomes more round; from whence it gradually tapers to the Point being six Lines in length.

The Head of the *Incus* is four Lines broad, *Fig. 6.* (1.) below which is the Neck or an oblique *Sinus*; (2) next to that are two *apophyses*, one on each side. These descending obliquely outwards, and becoming flat, meet in a Point, *Fig. 7.* (5.) whence ascending obliquely inward, this Production is joined to another small round one, like the *Manubrium Malleoli*  $4\frac{1}{2}$  Lines long (6.) This has the fore-mentioned small Excavation or half round *Sinus*, (7.) which with the Extremity of the *Stapes*, I suppose to have contain'd the *Os quadrangulare*, or rather *Orbiculare*, according to the Figure of the *Sinus*.

The *Stapes* differs much in Figure from the Human one. From its Concave extremity 'tis enlarg'd on each side by two small slender Productions, not unlike the Processes of the *Vertebrae* of some Fishes *Fig. 6.* (22) to which is join'd the *Basis*, (3.) so thin almost as the Scales of a Fish. This was accidentally separated from its two sides, and remain'd in the *Foramen Ovale*, from whence I pull'd it with a Pin; 'Tis Concave towards the *Stapes*, and Convex towards the *Vestibulum*.

The *Foramen Ovale* lies so hid and obliquely in the side of the *Cavitas Tympani*, that it could not be delineated in its true Dimensions. Near to it is another Hole oblong and sharp at both ends, both which give an entry into the *Vestibulum*.

The *Vestibulum* is of an irregular Figure, *Fig. 10.* (a) 'tis for the most part three Lines from the one side to the other, and perforated by eight Orifices, viz. five for the Canals of the *Labyrinth*, *Fig. 9.* 10. (a) one for the *Cochlea*, *Fig. 10.* (b) and two for the *Fenestrae* (b, c.)

The *Cochlea* is a long Cavity consisting of three Gyres or Meanders; *Fig. 11.* (d e f) its Orifice where it proceeds from the *Vestibulum* is but small; but it afterwards widens, so that the first Course of this Cavity is a third part larger than the second (e) and proportionally the third is less than the other two (f), till it terminates in an Orifice (g) situated in the Top, for receiving a Branch of the soft portion of the *Nervus Auditorius*, which accompanies and passes along all its Gyres.

The Hardness and Solidity of the Bone (for which it may be justly called *Os Petrosum* in this Subject) was such that I could not so exactly trace the three Canals or Ducts of the *Labyrinth*, so as to give a true Idea of the manner of their several Turnings. But *Valsalva's* Figures of the Humane Ear directed me so exactly, that I easily found out the



several Orifices, and opened them so far as to find out their Situation and true Dimensions, by introducing a Hogs Bristle, then cutting it off and stretching it out to the Scale. Thus after laying open the two *Foramina* which gave an Inlet to the *Vestibulum*, I soon perceiv'd the several Orifices which in so large Subject were pretty conspicuous. I first turn'd to the one Hand and discovered the *Duct* of the *Cochlea*; this I pursued all along the Protuberance, *Fig. 3. (d)* in doing which I laid wholly open the *Lesser Duct* of the *Labyrinth* *Fig 9, 10. (d)*. Then turning up the other side of the Bone, I trac'd the soft Portion of the *Nervus Auditorius* divided into two Branches, one whereof was distributed into the *Cochlea*, and the other to the *Labyrinth*. In filing the Bone a little further, I opened a small part of the *Middle Duct*, and in a short time I discovered the *Ductus Major*; after which I measured their several lengths as is said.

The *Labyrinth* then consists of three *Lineæ Semilunares* or incurvated *Ducts* whereof the *Major* lyes in that part of the *Processus Petrosus* which regards the Seat of the Brain *(b)*. This is twenty Lines or one Inch eight Lines long. The *Medius Ductus*, one part whereof regards the Orifice of the *Cochlea*, and the other is common with the *Major* for the space of three Lines; *(e)* this is fifteen Lines or one Inch three Lines long: And the *Minor* which regards the *Cavitas Tympani*, has one Orifice which is near to the *Medius*, where it approaches the *Cochlea*; and the other near to the Orifice of the *Major*. This is one Inch long.

The seventh pair of Nerves called in general the *Nervus Auditorius*, enters the *Processus Petrosus*, and is divided into the hard and soft Portions, as in other Animals. In this Subject I find one Canule entering the Bone from the sides of the Orifice for the *Carotide Artery*, about three Lines diameter, *(e) (b)* from thence running forward for the space of one Inch four Lines, then bending downwards one Inch, till it meets with the Orifice at the Sides of the *Meatus Auditorius*, by which it pierces the Skull, and passes outward. This Canule, after it is entered the *Processus Petrosus* for the space of eight Lines communicates with the Orifice, which usually enters the foresaid Process from the Base of the Skull; and both these Orifices, after they have accompany'd one another about five Lines, are separated, and the soft Portion penetrates the Bone at two places, as is said.

I have now endeavoured to give such a Description of the *Osseous* or Bony part of the Ear of this stupendious Animal, as I am in hopes may be useful for the clearing up of some *Phænomena* in lesser Subjects. At least we may hereby observe, what a variety of Mechanism the great Author of Nature has thought fit to employ, in the several Parts of different Species of Animals. Thus both the external Ear of Man, and of the Elephant lye flat, as being most convenient: for if they had been protuberant as in most Quadrupeds, how unsuitable would it have been in Man, who is the most perfect of all Creatures, not upon the account of his Reason alone, but also as he is a Pattern for



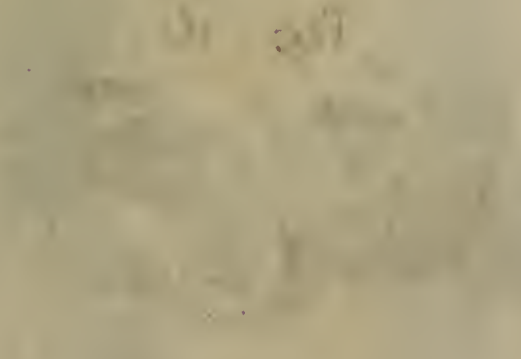
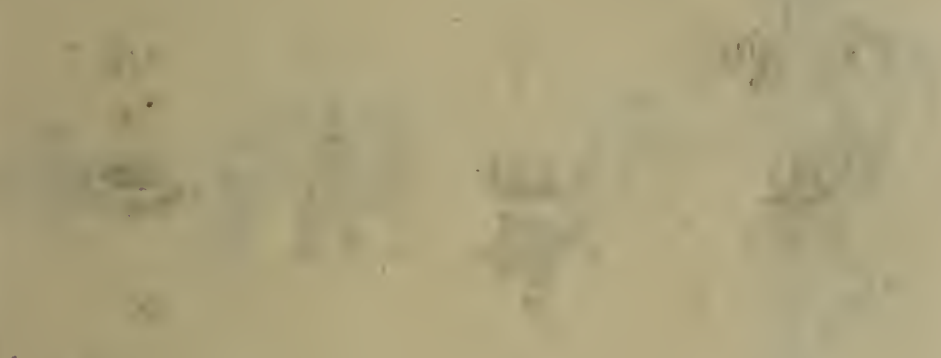
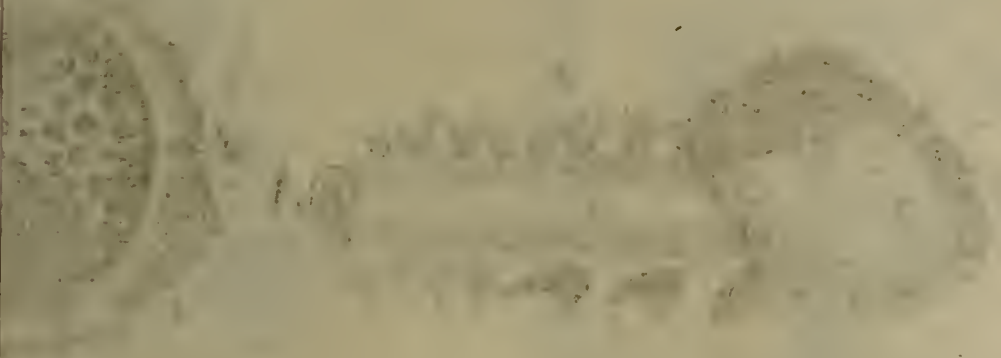




Fig. II.

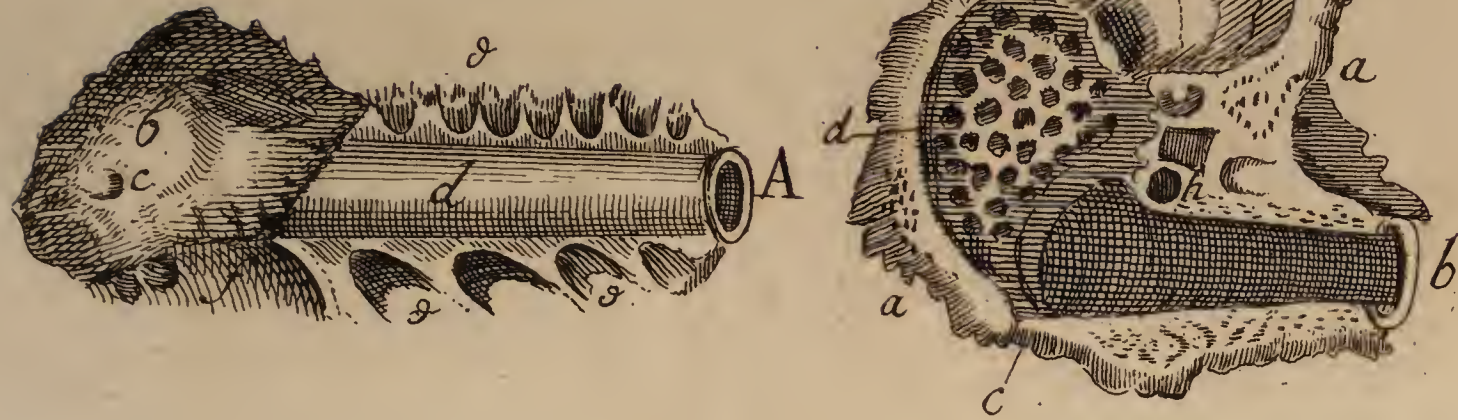
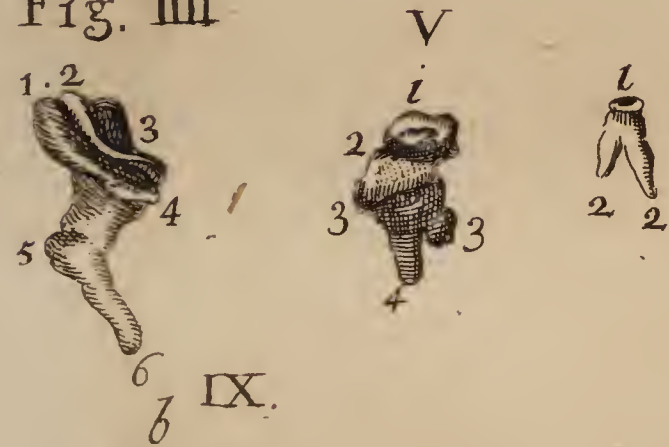


Fig. III.



Fig. III.



V.



VI.



VII.



VIII.



X.

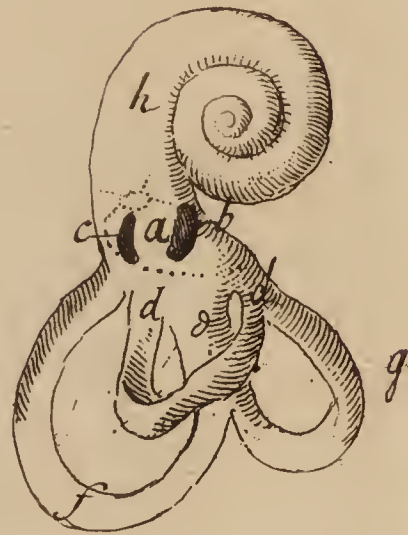


Fig. XI.



Fig. 12.



Fig. 13.

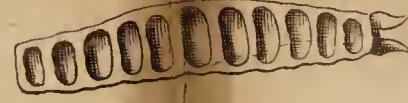


Fig. 14.

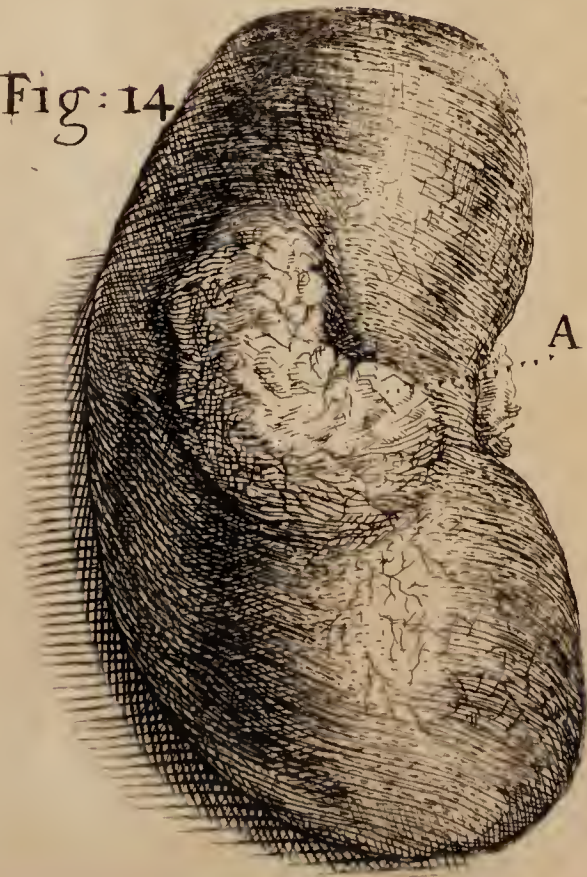


Fig. 16.



Fig. 15.



D.

D.



for Beauty and the Symmetry of his Parts; and how unseemly would it have been in the Elephant, if his external Ear had stuck out, and been proportional to his other Parts; considering what an extraordinary aspect he makes already by his Trunk and Tusks? But the Ears in these two Subjects differ by the Tortuosity of the Cartilage, and oblique *Meatus*, to prevent the Injury of the Air, by its immediate access into the inner Ear in Man: whereas in the Elephant the external Orifice is fully expos'd to the Air; but then the length of the *Meatus* hinders any more Air than is convenient from arriving at the *Tympanum*. We likewise see in the *Seal* and *Otter*, that those two Amphibious Quadrupeds have no external Ear further protuberant than the other parts of their Head; for had it been otherwise, their swimming and diving would have been much hindred: But its two sides are so collaps'd, that no Water can enter in when in the Deep, tho' it can receive sufficient Air when ashoar. The cellulous Cavity of the *Tympanum* in the Elephant, may well be compar'd to the *Apophysis Mastoides* in Man; and the second Cavity of a plain Surface seems to be Analogous to the Cavous *Mastoides* in Sheep, Cats, Dogs, &c. So that we see that whereas other Animals have but one Cavity for assisting the Vibration of the Air, and Continuation of the Sound in the *Tympanum*; this Animal has two, or a large one with two different Surfaces. The Aqueduct both by its Figure and Position in this Animal doth plainly shew us the use of it in other Animals, which is to receive the superfluous Humours in the *Tympanum*, and convey them to be discharg'd in the Mouth.

Fig. 1. Represents the Bony Part of the *Meatus Auditorius* of the right Ear. *a* The external Orifice of the *Meatus Auditorius*. *b* The *Processus Petrosus*. *c* The Orifice where the *Nervus Auditorius* enters. *d* The *Meatus Auditorius*. *e* A part of the *Laminae* which proceed from it on each side, by which the *Cellules* betwixt the two Tables of the Scull are form'd; those situated above the *Meatus* being remov'd. *f* Part of the inner Table of the Scull.

Explication of  
the Figures.  
Plate 12.

Fig. 2. Represents part of the *Meatus Auditorius* opened, with other parts of the inner Ear. *a* The ragged part of the Bone, from whence the *Os Petrosum* was separated. *b* The *Processus Petrosus* opened. *c* The *Crena* for the *Membrana Tympani*. *d* The Honey-comb Cavity of the *Tympanum*. *e* Its inner Cavity of a smooth Surface. *f* Its Semicircular or undulated Lines. *g* The Orifice of the Aqueduct. *h* The Orifice of the hard Portion of the Nerve.

Fig. 3. Represents the lower Surface of the *Os Petrosum*, as it was separated from above the *Tympanum* and other parts of the inner Ear. *a* The ragged Margin of the Bone. *bb* The upper part of the *Cavitas Tympani*. *c* The *Foramen Ovale*. *d* The Protuberance in which the *Labyrinth* and *Cochlea* are lodg'd. *e* The Orifice of the hard Portion of the *Nervus Auditorius*.



Fig. 4. Represents the *Malleolus* alone in its true Dimensions. 1. The Protuberant Head. 2 The Semicircular *Sinus* betwixt it and the Margin. 3 The *Sinus* which receives the Head of the *Incus*. 4 The Angle below the *Sinus* for the Head of the *Incus*. 5 The Angle where the *Manubrium Malleoli* begins. 6 The *Manubrium Malleoli*.

Fig. 5. Represents the *Incus*. 1 The Head of the *Incus*. 2 The *Sinus* or Neck of the *Incus*. 3 Two *Apophyses*. 4 A long Protuberance with the *Sinus* for the *Os quadrangulare* at its Extremity.

Fig. 6. Represents the *Stapes*. 1 The small part of the *Stapes*, where it is articulated with the *Incus*, with a *Sinus* at its Extremity, being the other half of the Cavity of the *Os quadrangulare*. 2 2 Two small Portions of the *Stapes*, where it is articulated with the *Basis*. 3 The *Basis* of the *Stapes* separated. 4 The whole *Stapes*.

Fig. 7. The *Malleolus* and *Incus* join'd together, with their lower side turn'd up. 1 The *Malleolus*. 2 Its Articulation with the *Incus*. 3 The *Incus*. 4 The *Manubrium Malleoli*. 5 A Point of the *Incus*, fram'd by the other two Productions. 6 The long Protuberance of the *Incus*. 7 The *Sinus* in the Extremity of its long Production.

Fig. 8. The *Malleolus*, *Incus* and *Stapes* articulated together. 1 The *Incus*. 2 The *Malleolus*. 3 The *Stapes* where it shuts the *Foramen Ovale*.

Fig. 9. Represents the upper part of the *Lineæ Semilunares*, or that side which is towards the passage of the *Nervus Auditorius*. a The five Extremities cut off. b The *Linea Semilunaris Major*. c The *Semilunaris Media*. d The *Minor*. e The common Canule between the *Major* and *Media*.

Fig. 10. Represents the *Cochlea* and *Labyrinth* together. a The *Vestibulum*. b The *Foramen Ovale*. c The *Foramen Oblongum*. d The *Linea Semilunaris Minor*, which is towards the *Cavitas Tympani*. e The common Canule to the *Major* and *Media*. f The *Major*. g The *Media*. h The *Cochlea*.

Fig. 11. Represents the *Cochlea*. a The *Vestibulum*. b The third Gyre or turning. c The Orifice. d The first Gyre or turning opened. e The second turning. g The Orifice at the top of the *Cochlea*.

Of the Opossum. by Dr. Tyson, n. 290. p. 1565  
\* Phil. Trans. n. 239. A-bridg. Vol. I. p. 881.

III. I shall beg leave to observe some few things, that may tend to the illustrating the History of this Animal, omitted in the Anatomy of the *Female Opossum*, lately \* printed.

And in the first Place, whereas I there queried to what Species in the Prædicament of Animals this Creature might properly be reduced? Now having upon the Dissection observed the *Penis* to be fleshy, and to have no Bone in it; I find it cannot be referred to the Dog or Weasel kind, as some have thought. However every little Help will contribute somewhat.



To give therefore my Thoughts on this Subject, I shall here propose a Division of such Terrestrial Animals as have many divided Claws and Nails at the end of them into

*Animalia* { *Χειρ-δάκτυλα* seu *Manu-digitata*, i. e. whose Feet resemble Hands, and have Fingers rather than Toes.  
*Ποδ-δάκτυλα* seu *Pede-digitata*, i. e. whose *digiti*, from the order of their Position and Shortness as also Uses, more resemble Toes than Fingers.

*Animalia Χειρ-δάκτυλα*, Quorum,  
 omnes sunt *Manu-formes*, seu *Animalia Quadru-mana*:  
 cum Pollice in omni Pede sc.  
 { *Simia* } *Caudata.*  
               *Romack.* } *Non Caudata.*  
               *Coati Brasil.*  
               *&c.*  
 { *Sine Pollice in Pedibus*  
    *Anterioribus* { *Vantrevan.*  
                       *Sciurus.*  
                       *Mus, &c.*  
    *Posterioribus* { *Genus Felinum.*  
 Duo tantum sunt *Manu-formes*, sc. vel

*Anteriores*  
 { *Cum Pollice* { *Mantegar.*  
                       *&c.*  
    *Sine Pollice.*  
    { *Cuandu Brasil. Margravii.*  
       *Tlaquatzin Spinosum Hernandez.*  
       *Hystrix.*  
       *Tamandua Brasil.*  
       *&c.*  
*Posteriores*  
 { *Cum Pollice* { *Carigueya. S. Opossum,*  
                       *&c.*  
    *Sine Pollice.*



Under the first Member of this Division I include the Ape and Monkey kind, which as I have shown in my Discourse of the *Ourang Outang*, ought rather to be reckon'd a Four-handed than a Four-footed Animal. And considering how large a Species of Animals may be reduced under this *Quadrumanous* kind, agreeing in this Particular, tho' in others different, I think it but just to assign them a general *Classis*, afterwards to be subdivided according to the gradual Differences they have from one another. The *Romack* therefore, though in the Head and Face much different from the Monkey kind, yet being *Quadrumanous*, and on each Hand having a Thumb, I reduce under this Head. This Animal was brought alive from *Fort St. George*. Whether it is describ'd by any, or what other Names 'tis call'd by, I do not know. And because in its Face and Head it so much resembles a Fox, and in the rest of its Body a Monkey, for the present shall call it *Ἀλώπηπιθνε*, *Vulpi-Simia*, or the Fox Monkey. But the next I have mentioned in this Class, the *Coati* of *Brasil* and *Virginia*, or the *Rackoon* or *Rat-toon*, though in its Body it does not resemble the Monkey kind, yet because it has Hands, like a Monkey, as *Margrave* tells us, I place likewise here; as may be all others, whose Feet are all formed like Hands, and have a Thumb in each.

For there are some that have not a Thumb on their Fore feet, and others that want one on the hinder. In the number of the former may be reckoned the *Vantrevan*, the Squirrel kind and Mouse kind, or any others that may be observed to have all their Feet formed like Hands, only on their Fore-feet do want a Thumb. The *Vantrevan* (as 'twas called by the Person that shewed it here in *London*) altogether resembles a Monkey, which on the Fore feet had only four long Fingers and no Thumb. 'Tis a beautiful Creature, very brisk and nimble in Motion and loving; has a very long Tail, by which it suspends its Body, as does the *Opossum*. The Squirrel kind on the fore Feet have four long Fingers, on the hinder five, and one like a Thumb. It makes use of the fore Feet like Hands, in holding up its Food to its Mouth, and lives on Trees, as do the Monkeys. But the Affinity between the Monkey and Squirrel kind does better appear by some Monkeys I have seen, which on the Belly have a large thick Furr, and a thick brushy Tail like the Squirrel, whereas usually on the Belly the Ape and Monkey are thinner of Hair, and that on their Tail is shorter. This sort of Monkey I call therefore the Squirrel Monkey or *Sciuro-Pithecus*, and have made a Figure of one of them. But its Face more resembled a Man's or an Ape's, likewise its Teeth, and in these respects is much different from the Squirrel kind. Nearer to the Squirrel comes the Mouse kind, which in the Shape of its Head, the long Teeth before, and the large and prominent Eyes more resembles the Squirrel kind, and makes use of its fore Feet as Hands, in feeding its self, where it has only four Fingers without a Thumb, but on its hinder has five, of which the inwardmost and outwardmost are placed  
at



at a distance from the Range of the three middle Fingers, like two Thumbs, as may be observed in some of the Lizzard kind. Why we should include the Cat kind in the number of the *Animalia Xneq-δάνυλα* some may question, since their Feet seem rounder, and to have rather Toes, than Fingers. But we may observe that it uses its fore-Feet like Hands in climbing and catching its Prey; and when it does so, it exerts its Claws and lengthens them; but when it uses its Feet in going and running it shortens them, that being most convenient for that purpose, so that 'tis well provided for both, and its *Digiti* are of a middle Nature between Fingers and Toes, as they are lengthened or shortened. And we may observe on each fore Foot there is a *Pollex*, or Thumb set at a Distance from the Range of the other Claws whereby they more resemble Hands, and on the hinder Feet there are only four *Digiti* without a Thumb.

We come next to those Animals that have only two Feet formed like Hands, and those are either the fore Feet, or the hinder.

Those whose fore Feet only are formed like Hands, have either a Thumb there, as the *Mantegar*, &c. or have only four Fingers without a Thumb, as the *Cuandu*, &c.

The *Mantegar* is an Animal not described as I know of by any Author, and the strangest that I have seen. It is about the bigness of a Mastiff Dog; it measured from the end of its Nose to the *Anus* three Foot 2 Inches; the Girth of the Body 2 Foot 2 Inches; the Head 14 Inches long; the Forehead 5 Inches broad; the Head somewhat resembles an Horse's; the Nostrils large; the Nose of a deep Cinnabar Colour, and the Bones of the Nose depressed lower than those of the Upper Jaw, where the Skin was an of Azure blew Colour; a large Tuft of Hair on the Forehead and likewise under the Chin; the fore part of the Body and inside of the Arms and Legs almost bare of Hair, the Hair on the outside of them, of a mottle brown and olive Colour; on the Back blackish: There were *Mammæ* on the Breast; an *Umbilicus*; and the *Præputium* without a *Frænum*, as in the Ape kind; the *Præputium* of a Vermilion Colour; the *Scrotum* of an Azure; it had no Tail; 'tis very fierce, having two long Tusks in the Upper Jaw, and very lascivious; the fore Feet perfectly resemble Hands, having long and thick Fingers and a Thumb, and all the Nails of those Fingers flat; the Nails on the hinder Toes and Fingers imbricated, not flat; and though the Claws were pretty long, and somewhat imitating Fingers, yet the Thumb not so perfect, and the whole different from the fore Feet. When sitting and supporting its self by a Stick in one Head, being thus erect, and holding a Cup in the other, it would drink out of it, and not lap; its Food was chiefly Fruits.

Amongst those Animals whose fore Feet are like Hands, and have no Thumb, I reckon the Porcupine kind, as the *Cuandu* of *Brasil*, a sort of Porcupine described by *Margrave* and *Jo. Nieuboff* (*Voyages* pag.



pag. 18) which on the Fore-feet hath but 4 Fingers, on the hinder 5. Therefore as *Margrave* observes, for want of a Thumb, it is but slow in climbing Trees; but the better to help himself, it twists its Tail about a Bough, to save its self from falling. And much alike, if not the same, is the *Tlaquatzin Spinosum* of *Hernandez*. So the Common Porcupine, before has 4 Fingers, behind 5. So the *Tamandua* of *Brasil*, or *Ant-Bear*, before has but 4 Fingers, where the want of length in the Fingers is supplied by that of the Nails, and behind has 5 Toes. But I must confess there must be some Allowance made, for ranging this *Anomalous* Animal (as Mr *Ray* calls it) here. But because he climbs Trees, and in doing this makes use of his Tail, as some others here mentioned do, I was willing to put him into the Croud. And, unless it can be otherwise better ranged, we may likewise shuffle in here the *Ai, Ignavus*, or Sloth, because it climbs, and lives on Trees, and has a Head not unlike an Ape's; and, as *Margrave* assures us, two Teats on the Breast, but on each Foot had but three Claws, with very long Nails, like the *Tamandua*, and its Feet being very narrow and thus defective in Toes, 'tis very slow in Motion.

Amongst the Animals whose hinder Feet only are like Hands, is to be reckon'd the *Carigüeya* or *Opossum*; and if there be any other Animals that have their hinder Feet formed like Hands, either with or without a Thumb; they may be reduced hither, my chief Design in this Scheme being (as near as I could) to include all those Animals that are observed to climb or live on Trees, into a Class together; and they being observed to have their Claws, either all or many of them, formed like Fingers, I place them therefore under this general Title of *Animalia Χειρ δάκτυλα*.

Now begging pardon for this Digression, we shall proceed in our Observations on the Male *Opossum*.

In describing the Ears of which, I had not an opportunity of observing that white *Rim* that incircles them, which is very beautiful: for when in Health, for the breadth of two lines or more, there runs an Edging round the Verge of the Ear of a perfect Milk white Colour. But the Ear here being so very thin and tender, 'tis easily affected by cold or illness, and then this white part becomes jagged and crimped, as if burnt up; and the whiteness disappears; as it happened in this last subject before his death, as well as the first, which occasioned my not observing it then. 'Tis on this account that *Margrave* in his Description of the *Tai-ibi* of *Brasile*, which now I take to be the Male *Opossum*, saith, it has *Aures subrotundas, molles, graciles, albas, teneras, ut Charta molles*, not that the whole Ear was White, but only the Edges. But what I was most desirous to know, was whether the Male had that *Marsupium* or Pouch for receiving the Young, as is affirmed by some. Mr. *Cowper* in the Subject he dissected, neither observed the Pouch nor the Muscles belonging to it, as has been described in the Female: Nor indeed did I in that I dissected. Only this I took notice of when first I had it; that the Skin here seemed to be looser; so that with my finger



ger I could easily thrust it in, and by turning it round, could form for the present a Pouch; but this would easily turn out again, upon withdrawing my fingers. Whether therefore 'tis capable of being formed into a Pouch or *Marsupium* upon occasion, I shall leave as a Quæry to be resolved by those that live where they breed, Whether they ever observe the Male to receive the Young ones as do the Females? However, in the Male there were those Bones I call *Marsupialia*, and I observed Muscles running from them to the hinder Legs, which, no doubt, are very serviceable to them in drawing up their Bodies, as I find Mr Cowper has likewise remarked.

I shall conclude this Paper with some few remarks I made upon the Brain, where I observed that being taken out of the *Cranium* it weighed two drams two scruples. I did not find either in the *Cerebrum*, those *Anfractus*; or in the *Cerebellum* those *Circilli* which we usually meet with in other Brains. The whole was of an Oblong figure, and seemed to be divided into three Parts, *i. e.* The *Cerebellum*, the *Cerebrum*, and that part of the *Cerebrum* which was projected into the *Rostrum*. For by the Pinching in of the *Cranium* here, the fore part of the *Cerebrum*, from whence issued the *Processus Mamillares* and *Olfactory Nerves*, was by this Constriction, remarkably distinguished from the *Cerebrum*; like an *Anterior Brain*. In the Vermin kind, and those that have a long *Rostrum*, I have observed the like. For Nature here seems to give them more particularly the advantage of the Sense of Smelling, for finding out their Prey, or avoiding the Danger they would shun.

So likewise I observed the Optick Nerve, as likewise the Eye to be large; the better to look out for the one, or the other. And when I have mentioned the Auditory Nerves to be large likewise for the same reason, to give them a quick sense of hearing any sudden Noise, and so to avoid the Danger, these were the greatest Remarks I made upon the Nerves. It was observed that it saw best in the twilight, and not so well in the bright Sun; which I was easily brought to believe, because it was then to seek out for its Prey. In the Eye I observed the *Membrana Nictitans*; The *Glandula Lachrymalis* was large and oblong; there was the *Musculus septimus suspensorius*; and the *Crystalline Humour* was large, very transparent and almost of a globular figure; the Eye or *Iris* black.

IV. This Male Opossum, was brought from *Virginia* and presented to the *Royal Society*, by *William Bird Esq*; and was also kept alive in their Repository; but falling from its meat (like that you examin'd I guess) it languished and dyed: The cause of its Death appeared to be from a Mortification of the *Duodenum* immediately below the *Pylorus*, which seemed to arise from a quantity of Hay, that had been collected in the Stomach, and matted together in the shape you have described, and figured the \* hairy *Tophus* you found in the Stomach of that you dissected, but I could not find any hair in this; this wad of hay slipping out of

*Anatomy of the same.* by Mr. Cowper. *ib.* p. 1576.

\* *Phil. Trans.* n. 239. Tab. 2. Fig. 4. Abr. Vol. II. Fig. the 256.



the Stomach stuck in the *Duodenum*, which together with the viscid matter that involved it, compleatly obstructed the Passage in that Gut, as well as that of the Gall into the Gut, which appeared from the Distention of the Liver as well as fullness of the Gall Bladder. The *Omentum*, which in this Creature is only fastened to the bottom of the Stomach, had also suffered a Gangreen, as had almost the whole Canal of the Guts: but of this by the by, my design being only to give you an account (such as it is) of those Parts of the Male, which distinguish it from the Female.

Besides the Organs imploy'd in Generation, the Male *Opossum* differs externally from the Female, there being no *Marsupium* or Pouch to receive the young ones, which you have given so exact a description of; nor are there any Muscles inserted to the Skin of the *Abdomen* springing from the *Ossa Marsupialia*, as you call the Bones, which may deserve the Name of *Hyoides*, from the figure they make with the *Ossa Pubis* of this Animal; which Bones do not seem to differ in the Male, from those of the Female you have described and figured in the Transactions abovementioned.

Plate 13.  
Fig. 1.

There is no external appearance of Genitals in the Male *Opossum* but the *Scrotum*; which is but just big enough to contain the *Testes*; nor could I readily discover any other *Foramen* outwardly in these parts but the *Anus*, *A.* which leads to the *Rectum*; but on withdrawing its sides, I found another *Foramen*, *B.* which on Dissection appeared to be the *Præputium* or Out-let of the *Penis*. On compressing the parts on each side this *Cloaca*, *A. B.* I observed two Drops of yellowish colour'd Liquor (of the resemblance of *Pus*) start out on each side the *Anus*, *c. c.* which on further examination I found come from two glandulous Bodies or Bags placed on the Sphincter Muscle of this Part. This sort of Liquor (it seems) you found in the Pouch of the Female, which, like this, had more of the peculiar *Fætor* of this Animal, than any other part besides; for on removing these Parts with the Skin about the *Cloaca*, I was freed from the ungrateful Smell of it. On separating the Skin from the Muscles of the *Abdomen*, the two above-mentioned Bones (peculiar, I believe, to this Animal) appeared, from whence some Muscles sprang, and were inserted to the *Ossa Femorum*, which performed the Office of the *Psoas* Muscles in other Animals, which last named Muscles were much smaller in this than in other Creatures.

The *Abdominal* Muscles were also fastened to the last mentioned Bones, particularly the *Recti*, which enabled this Creature to project or spring its Body, especially in pulling its hind Legs forward, with more advantage or force than other Animals, which are without these Bones. Immediately under the Skin about the *Cloaca*, I found a thin fleshy Muscle, inclosing the *Præputium*, and lower parts of the *Rectum* and *Odoriferous* Bags, together with the four *Mucous* Glands, *MMNN* at the roof of the *Penis*, and body of the *Penis* it self *A*; all which parts were liable to be compressed by the Action of this Muscle, especially when

Fig. 2. 3.



when the *Penis* is erected, whereby its Erection is sustained, by compressing the two external Veins on the *Dorsum Penis*, of which more hereafter, when I come to speak of the manner the *Penis* of this Animal is erected. On removing this thin broad Sphincter Muscle, I was obliged to clear away two Lumps of hard Fat before the Body of the *Penis* could be discovered; but we shall leave these Parts till we have cleared the *Testes*.

The *Scrotum* being remov'd, each Testicle appear'd as represented on the left side *Q TV*. the *Vasa præparantia* and *Deferentia* *Q Q* being inclosed in the Cremaster Muscles, *P P*. These Muscles were proportionably very large in this Animal, as I have always observ'd them in Creatures, that have no *Vesiculæ Seminales*, which is the Case of this Animal, and this Provision of Nature seems not only necessary to suspend the *Testes*, but these inclosing Cremaster Muscles also compress the *Epididymides* and *Vasa Deferentia*, and oblige them to dispatch their Contents (the *Semen*) into the *Urethra* in the time of the Coition, which otherwise would have a slow progress; but this contrivance appears more peculiarly requisite in this Creature, because the defect of the *Vesiculæ Seminales* here, seems to be supplied by the largeness of the *Epididymides* of the *Testes* *W W* which are the excretory Ducts of the *Testes*, and appear in this Animal to have a larger Bore than ordinary: For this reason the *Tunicæ Vaginales* are very streight in this Animal, as appears in the Figure *TV R R*.

Fig. 2.

Fig. 2, 3.

Fig. 2.

Fig. 2.

On discovering the Originations of the Spermatick Arteries, I was surpriz'd to meet with an appearance I never heard of nor observed before; and in this I should not have had any satisfaction, if I had not first injected Wax into the Trunks of the great Artery *iii i* and *Vena Cava* *h* below the Diaphragm. It seems the descending Trunk of the great Artery, below the emulgent Arteries in this Creature, is placed directly under the Trunk of the *Vena Cava*, nor do the Iliack Branches of the Arteries here, twine about those of the Veins, as in Human Bodies and some Quadrupeds, which is done perhaps to compress the Channels of the Veins, by means of the Pulsation of these Arteries to drive up the Blood in the Veins towards the Heart; but that contrivance seems no way necessary in this Animal, because the contrary position of its Body is more customary in hanging by its Tail with its Head downwards: It is not unlikely, if the Veins of this Animal were examined below the Heart (which indeed I did not think of till those Parts were thrown away) but we should meet with some Contrivance to prevent the Precipitate Flux of the Blood in that Pendulous Position, as I have observ'd in the Trunk of the *Cava* immediately above the Liver in Dogs. But to return to the Spermatick Vessels.

The Arteries *a a* arise from the forepart of the Descending Trunk of the great Artery, and pass through a very small Perforation\* . . . . . made on purpose in the *Vena Cava*, and descend straight to the *Testes*, as in Human Bodies, and are not contorted in their progress, as we find

them



(a) *Phil. Transf.*  
n. 280. p. 1180.  
v *supra* Part  
II. p. 125.

Fig. 2.

Fig. 2, 3.

Fig. 1.

them in most, if not in all Quadrupeds. This Perforation of the *Cava* perhaps was not only made for transmitting the Spermatick Arteries, but may also frame an *Annulus*, that may check the Velocity the Blood would otherwise have in those Arteries, which rapid Motion of the Blood we find Nature studiously avoids in the *Testes* of all Animals: For in Men we see these Spermatick Arteries (contrary to all other Trunks of Arteries) are less at their Originations from the Great Artery; and in Quadrupeds (except in this) the Spermatick Arteries are contorted before they reach the *Testes*, as I have (a) elsewhere taken notice. The Spermatick Veins, after leaving the *Testes* of this Animal (like those of Humane Bodies) have several Divisions and Inosculation, which are all reduced to one Trunk on each side, and empty themselves into the *Cava* immediately above the Perforation *b b*.

Had the known Structure of the *Testes*, in relation to their Excretory Ducts, been left undiscovered till now, the bare Inspection of those parts in this Animal would instruct us: for on dividing the *Tunica Vaginalis* (*R R*) I found the inclosed Testicle and its *Epididymis* lying loose, insomuch that they parted from each other as exprest *W X Y Z*, and with the Assistance of a pretty large Convex Glass I could see the Excretory Duct *Z* arising from one end of the Testicle, where the Spermatick Artery and Vein *Y* may be seen: After that Duct has marched a little way, it may be seen folded up into the Body call'd *Epididymis W W*, and at length makes the *Vas Deferens S S*. You know in Men, and most, if not in all Quadrupeds, the *Epididymides* and *Testicles* cleave so to each other, that without some Dexterity in Dissection the rise of them from the *Testes* is not to be discovered. This proves to us the use of Comparative Anatomy in detecting the Structure of parts which is very obscure in other Subjects as well as in Humane Bodies; but to return to the *Vasa Deferentia S S*. after they leave the *Præparantia a b*, as in Men and other Creatures, they grow somewhat larger, but on crossing the Ureters *e e* become less again at their Entrance into the *Urethra*, immediately below the Neck of the Bladder; where their Orifices could be perceived on each side a Caruncle: Nor are there any *Vesiculæ Seminales* near the *Vasa Deferentia* of this Animal, as in Boars, Bulls, Horses, &c. which nevertheless cannot be allowed to communicate with each other as in Men; for tho the *Vasa Deferentia* and *Vesiculæ Seminales* of those last mentioned Animals empty themselves into the *Urethra* at the same Orifices with the *Vesiculæ Seminales*, yet their communicant Ducts are so very short, that whatever comes by the *Vasa Deferentia* will sooner escape into the *Urethra*, than be received by the *Vesiculæ*, as in Men.

The length of the *Urethra* between the Bladder and the *Penis* exceeded 4 Inches, more than 3 Inches and an half of which was inclosed with a Glandulous Body, analogous to the *Prostates* in Men and other Creatures; the Orifices of the Secretory Ducts of this Glandulous Body



Body are very numerous, and open into the *Urethra* on all sides, as appear'd on opening the *Urethra*, and compressing this Glandulous Body or *Prostatae*, I saw its secreted Juice start out.

This part of the *Urethra* *IKKL* thus inclosed with the *Prostates*, being very much contorted or folded, in its Natural Situation between the Bladder and the *Penis*, when there is no Erection, must necessarily be drawn out, and becomes straight when the *Penis* is extruded (which I shall shew by and by happens upon an Erection) by which means this Glandulous Body is necessarily compressed, and the *Succus Prostatarum* forced into the *Urethra*. The *Prostatae* of divers Animals are compressed by Muscles fram'd on purpose that inclose them, as in Boars, Rams, &c. in Men they are compressed by the *Musculi Levatores Ani*. Fig. 2, 3.

At the Root of the *Penis* of the *Opossum* we meet with four Glandulous *Vesiculæ* *MMNN* two on each side, which empty themselves into the *Urethra*, and contain a mucous Matter, like that I find in the Glands I lately discover'd in this part in Men. These *Vesiculæ* are not only compressed by the thin broad Sphincter Muscle above mentioned, but the Bulbs of the Cavernous Bodies of the *Penis* *CC*, and *Urethra* *EE*, when distended (in the Erection of the *Penis*) also compress these mucous Bags. This Compression is effected in Men by the Intumescence of the Bulb of the Cavernous Body of the *Urethra*. In Boars, Rams, Cats, &c. we find Nature so solicitous to discharge the Contents of the Excretory Ducts of these Glands, that (like the Gizzard of Birds) each Mucous Gland is inclosed with a proper Muscle to compress it.

The *Penis* fell next under my Examination, the Fabrick of which appears not less surprizing, than that you met with in the *Uterus* of the Female; and in many Circumstances differ'd from what I have found in Animals I have hitherto dissected: Besides the forked Glans of its *Penis* *BB*. its Cavernous Bodies *DD*. had no Connection with the *Ossa Pubis*, nor did the Muscles call'd *Erectores* or *Directores* *CC* cleave to any Bone as in Men and Quadrupeds, but all those parts lay loose under the *Ossa Pubis*. The other Extremities of the two *Corpora Cavernosa* *Penis* are received into the Glans. Nor did the *Corpus Cavernosum Urethrae* or its Muscles *EE* cleave to the *Sphincter Ani*, as in most other Creatures. But the whole Body of the *Penis* lay loose between the Bones of the *Pubis* and the *Rectum*, so that on the Intumescence or Erection of the *Penis*, it is at liberty to be extruded from its *Præputium*, wherein it is secured from outward Injuries when not erected. To favour this Extrusion of the *Penis* in this Animal, the *Urethra* *IKL* is not only very long between it and the Bladder *OO*, but I found it much more contorted or folded in acuter Angles, than is express'd in the Figures, else the *Penis* could not be extruded, but the Bladder *OO* must follow it. Besides it appears, Nature design'd this Extrusion of the *Penis* of this Animal in its Erection, because we meet with Instruments to withdraw it again into the *Præputium*. *ffG* shews a pair of Muscles elegantly Fig. 2, 3.

Fig. 3.

Fig. 2.



Fig. 2, 3.

elegantly framed for that purpose on the fore part of the *Penis*; they arise fleshy from the *Corpora Cavernosa Penis D D*, and becoming tendinous *ff*, as they pass through two Ligaments or Pulleys on the *Ossa Pubis*, and are afterwards united into one Tendon *G*, which is inserted to the upper part or *Dorsum Penis*. Besides this pair of Muscles, (which is peculiar perhaps to this Animal) I found another pair of Muscles *H H*, that also withdraw the *Penis* arising from the *Rectum*, and are inserted to the Extremities of the *Corpora Cavernosa Penis*: In Cats, Male Porpess, Bulls, Rams and Boars, we meet with two Ligaments springing from the *Os Sacrum* or *Ilium* on each side, and inserted to the *Corpora Cavernosa Penis* of those Animals, which like these Muscles serve to withdraw the *Penis* of those Creatures into the *Præputium*.

Fig. 2, 3.

Fig. 4.

Fig. 2.

The *Corpora Cavernosa Penis* of the *Opossum* differ in their figure from what we find in other Creatures; their upper parts are bulbous *D D*, and covered with Muscles *C C* like the Bulb of the Cavernous Body of the *Urethra* in Men: In other Animals, those Parts of the *Corpora Cavernosa Penis* are of a conical Figure. The Muscles of the Cavernous Bodies of the *Penis* of this Creature having no Connection with the *Os Pubis*, cannot apply the *Dorsum Penis* to the last nam'd Bone, and compress the Vein of the *Penis*, whereby to retard the Refluent Blood, and cause an Erection, as we have observed in other Creatures; but some large Veins of the *Penis* here, take a different Course and pass through the middle Parts of the Bulb *K K C*, and are only liable to the Compression made by the Intumescence of these Muscles *C C*, that inclose them. But the chief Agent in continuing the Erection of the *Penis* in this Animal, is the Sphincter Muscle of its *Anus*, or rather *Cloaca*, to which the broad Sphincter Muscle above-mentioned is continued, and does somewhat contribute. When the *Penis* is extruded from the *Cloaca* (which must happen when it is erected) the Sphincter of that part necessarily embraces it, the like must be done by the Sphincter Muscle of the *Cloaca* of the Female in Coition: On these Accounts I apt to think, these Creatures are not very quick in that Act. Besides the Figure of the *Penis*, Fig. 4. shews an unsuitness for its Retraction till there is a Detumescence of its Glans *AB*, which perhaps does not happen in these till both Male and Female are satiated, as in Dogs and other Animals that have Bones in their *Penis*, and have a bulbous Intumescence of the Glans in Coition, and no *Vesiculæ Seminales* as in this Animal, and also impregnate the Female with more than two or three at a time, as this does.

Fig. 2.

Fig. 4.

As this Bulb of the Cavernous Body of the *Urethra* in Man is fram'd for the use of the Glans, to keep it sufficiently distended when required, so it seems it is necessary to have two of those Bulbs inclosed with their particular Muscles *E E* in this Animal, to maintain the Turgescence of its doubled or forked Glans *AB* when the *Penis* is erected. In this Distention of this Glans *Penis* of this Creature, the middle part of the Orifice of the *Urethra* (in which you see the Probe passing



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Fig. I.



Fig. II.





passing out of Figure 3.) is necessarily compressed, as represented Fig. 4. *D*, and two distinct Apertures *CC* are left, as appears by the last mentioned Figure 4. *AB* on each side its forked Glans.

They that fancy an *Aura Seminalis* of the Male passes by the way of the Blood of the Female to their *Ovaria* to fecundate the *Ova*, will here meet with an Instance I must leave them to solve. For to what end has Nature been at the trouble of making double Emissaries for the *Semen* of the Male *Opossum*, though she design'd the Impregnation of a double *Uterus* of the Female? Certainly one passage in the *Glans Penis* would have been sufficient to convey the *Semen Masculinum* to the Mass of the Blood of the Female in the manner they conceive. Nature would never have been at the Trouble of all this Clutter in this Animal, in making a double Glans, and contriving two distinct Apertures in the Glans, when the *Penis* is erected, if the Propagation of the Species had not depended on't: Doubtless 'twas for that end chiefly, that the *Penis* of this Animal differs so much from what we meet with in other Creatures. Nor could the *Penis* of this Animal in these Circumstances, be expos'd in a *Præpuce*, as in other Quadrupeds, by reason of the numerous Accidents that would certainly attend it in this Animal's way of living: Nor could its *Penis* have been thus withdrawn when not erected, and sufficiently extruded when it is, if (as in other Creatures that are retromingent also) the *Penis* here had been fastned to the *Ossa Pubis*.

Thus we see Nature in these Instances, accomplish the same ends by different Methods. Although there are no *Vesiculæ Seminales* in this Animal, as in Dogs, Weasels, &c. yet we find its *Penis* without a Bone in it, as in those Creatures; but then we meet here with Additional Contrivances to maintain its Erection: Not only the Sphincter Muscle of the *Cloaca* of the *Male Opossum*, but that of the Female also closely embraces its *Penis* in Coition, and effectually retards the reflux Blood from its *Corpora Cavernosa*, by compressing the Veins of the *Penis* *E*. Nor could the *Penis* of this Animal be fram'd like that in Boars, Rams, Bulls, &c. in whom the *Corpora Cavernosa* are too large, when not erected, to be secured within the *Cloaca* of this Animal.

Fig. 3.

Fig. 4.

Fig. 1. Shews the external Appearance of the Genitals of the *Male Opossum*, somewhat less than the Life. *ABcc*. The *Anus* or *Cloaca*. *A* its lower Part which leads to the *Rectum*. *B* its upper Part or Orifice of the *Præputium*, whence the Urine and *Penis* is extruded. *cc* Two small Apertures, whence the yellowish colour'd Liquor, that had the peculiar *Fætor* of the Animal had its Exit. *D* The *Scrotum*, just large enough to contain the *Testes*. *E* That part of the *Abdomen*, where the *Marsupium* is seen in the Female, which here appears a little more depressed than in other Animals, but cannot retain the young ones, as does the Pouch of the Female. *FF* The two Thumbs of the hind Feet or Hands.

The Explanation of the Figures.  
Plate 13.

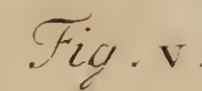
Fig. 2.



Plate 13.

Fig. 2. The fore Parts of the Organs of Generation dissected from the Male Opossum; done as big as the Life. *AA* the Body of the Penis. *AB* The forked Glans. *CC* The Muscles Analogous to the *Directores Penis* in Men and other Creatures, which here inclose the *Bulbi* of the Cavernous Bodies of the Penis. *DD* The two *Corpora Cavernosa Penis*, before they joyn and make the Body of the Penis. *EE* Parts of the two Bulbs of the Cavernous Body of the Urethra. *Gff* A pair of Muscles, whose two Tendons *ff* pass through two Ligaments or Pulleys on the *Ossa Pubis*, and are afterwards united into one Tendon *G* inserted to the *Dorsum Penis*, and serve to draw the Penis within the Cloaca after an Erection. *HH* Two other Muscles which serve for the same use, and arise from the *Rectum*, but are fixt to the opposite part of the *Corpora Cavernosa Penis*. *I* The Urethra where it has no Glandulous Body inclosing it. *KK* The *Prostatæ* or *Corpus Glandulosum*, inclosing the Urethra, which lies contorted between the Penis and Bladder of Urine in the Pelvis of the Abdomen of this Animal. *MN* Two Mucous Bags on each side, at the Root of the Penis, which empty themselves into the Urethra. *OO* The Bladder of Urine. *PP* The *Musculi Cremasteres*. *QQ* The left Cremaster Muscle inclosing the *Tunica Vaginalis*. *RR* The *Tunica Vaginalis* of the right side, opened to shew the inclosed *Vasa Præparantia* and *Vas Deferens*. *SS* The *Vas Deferens*. *TV* The *Tunica Vaginalis* inclosing the left Testicle, with its *Epididymis V*. *WXRZ* The right Testicle, as it appear'd on opening the *Tunica Vaginalis*. *W* Its *Epididymis*. *X* The Body of the Testicle. *Y* The Spermatick Vein and Artery as they pass to and from the Testicle. *Z* The excretory Duct of the Testicle, which could be distinctly seen arising from the *Testes*, and marching to the *Epididymis W*, where it is folded up and constitutes that Body, whence it is continu'd to the Bladder of Urine, and call'd *Vas Deferens SS*. *aa* The Spermatick Arteries arising from the fore part of the descending Trunk of the *Arteria Magna*, where they have a common Ductus, which is divided as it passes through an Aperture \* made on purpose in the Trunk of the *Vena Cava*. *bb* The Spermatick Veins at their entrance into the *Cava*. *dd* The Kidneys. *ee* The Ureters. *gg* The emulgent Veins. *ψ* Part of the left emulgent Artery. *h* The *Vena Cava* below the Liver. *ii* The descending Trunk of the Great Artery. *kk* The Mesenterick Arteries. *l* The lower Mesenterick Artery, which in this Animal does not arise from the great Trunk. *m* The left *Glandula Renalis*, that of the right side being placed behind the Trunk of the *Vena Cava n*. *o* A common Trunk of an Artery, from whence springs the Gastrick, the Superior and Inferior Mesenterick, and the Emulgent Arteries of this Animal. The Design of Nature in confining all those Arteries to one Trunk in this Animal, might be perhaps in favour of its usual posture in hanging by its Tail, with its Head downwards. This Trunk of the Arteries of the *Viscera* of the lower Belly, having so many united Forces, is the less liable to any Compression











Compression that might be made by the contain'd Parts of the lower Belly in that Posture.

Fig. 3. The back side of the Genitals of the *Male Opossum*. *A* The Body of the *Penis*. *B* Its Glans. *C C* The *Bulbi* of the *Corpora Caverosa Penis* covered with their Muscles. *D D* The *Corpora Caverosa Penis*. *E E* .... The two distinct *Bulbs* of the Cavernous Body of the *Urethra*, inclosed with their particular Muscles. *F F G* Parts of the Muscles exprest on the fore part of the *Penis* in the preceding Figure. *H H* The other pair of Muscles springing from the *Rectum*, and inserted to the sides of the *Corpora Caverosa Penis*. *I K L* The *Urethra* covered with the *Prostatæ* *K L K*. *M N* The two Mucous Bags on each side. *O* The Bladder of Urine. *P* The *Musculus Cremaster*. *Q* The *Tunica Vaginalis* open'd. *R* *Vasa Præparantia* cut from the great Trunks. *S S* The *Vas Deferens* on each side. *W X Y Z* The left Testicle, as in the preceding Figure, with the opposite side here towards you. *ee* Parts of the Ureters. \* \* A Probe inserted into part of the *Urethra*.

Fig. 4. The fore part of the *Penis*, as it appears when its *Corpora Caverosa* are fill'd with Mercury and dry'd; figur'd as big as the Life. *A B* Its forked Glans. *C C* .... The two distinct Apertures that appear in this Distention or Erection of its *Corpora Caverosa*. *D* ... The middle part of the Orifice of the *Urethra*, which is occluded on the Intumescence or Erection of the *Penis*. *E* .... The two Veins of the Glans, which are compress'd by the two Sphincter Muscles of the Male and Female in Coition. *F* The *Bulbs* of one of the Cavernous Bodies of the *Penis* distended. *G* One of the *Bulbs* of the Cavernous Body of the *Urethra* also distended. These *Bulbi* were open'd on the other side  $\Psi$  to fill the Cavernous Bodies with Quick silver, but are all exprest as they ought to appear on both sides in the following Figure. *H* The *Urethra*. *I* The Muscles dryed, exprest Fig. 2. and 3. *F F f f G*. *K k* The Veins tyed up to keep in the Mercury, as they pass the Muscles of the *Bulbi*.

Fig. 5. The back part of the *Penis* exprest in the preceding Figure. *A B* Its forked Glans. *E E* Parts of the Veins arising from the Glans. *F F* The *Bulbs* of the Cavernous Bodies of the *Penis*. *G G* The two *Bulbs* of the Cavernous Body of the *Urethra*. *H* The *Urethra*. *K K k k* The Veins tyed up, as they pass out of the *Bulbi* to keep in the Mercury.

V. We observ'd the *Intestinum rectum* of a great Length, having large *Pilulæ* of Dung *secundum intervalla*, I call here the Gut (so far as it had no *Cellulæ*) *rectum*, though indeed it had but one or two Convolutions.

Dissection of  
an Hare, by  
Mr. John Ray.  
n. 307. p. 2302.

The *Intestinum cæcum* was of a vast Bigness and Length, in Bigness it far exceeded the Colon, and was full of Excrement. Just at the Entrance into it out of the *Ileum* was another Appendix of a Globular



lar Figure; the *Tunicæ* of it more fleshy, and fuller of Veins and Arteries than the adjoining *Cæcum*; there was also a little round Hole in it. The *Cæcum* towards the farther end of it was small, round, fleshy, full of Vessels, and colour'd like the *Jejunum* in a Man, the inner *Tunica* granulated for more than 4 Inches in Length.

The Spleen was small and long, thicker at one end, it had no *Vesicula fellea* that I could find. [In another we found the *Vesicula fellea manifestly*.] The Kidneys large, and the Left situate higher than the Right. The *Glandulæ Renales* receiv'd not their Vessels from the *Emulgents*, but from great Veins on each side going to the Loins.

The Stomach was full of Grass, as I conjectur'd, which smelt like the Wax of an Honey-Comb, when the Honey is newly drain'd from it.

It was a Female, and had long *Cornua Uteri*, but did not *gestare*, when we cut it up.

It seemed to have such a Cavity under the Tail, above the *foramen ani*, as I have observed in a Badger.

I believe now that the Matter contained in the Stomach was Fir chewed small, the which the Smell argued.

Dissection of a  
Mountain Hen.  
by the same.  
ib. p. 2303.

VI. In Gallina montana observavi appendices duas prælongas, dimidium ulnæ excessisse credo: Ad principium suum ubi a recto oriuntur, post 3 aut 4 uncias reflectuntur seu convolvuntur, at in prima hac convoluzione nulla intus excrementa continent; tum sursum juxta intestinum utrinque ascendunt, & sunt amplissimæ atque excrementis plenæ: Ad ingressum suum ubi intestino recto cohærent, habent velut annularem Musculum seu Sphincterem.

Hepar satis grande, in duos præcipuè lobos divisum. Vesiculam felleam nullam inveni, verum poros biliarios duos magnos, diversis osculis non procul tamen dissitis, sese in intestinum duodenum aperientes.

Lien exiguus triangularis. Ventriculus mediocris, musculosus, cujus interior tunica in duritiem fere corneam concreverat aliqua sui parte: Cor amplissimum.

In ventriculo & ingluvie summitates & germina Abietis frondium, quæ apertæ resinaceum & non ingratum expirabant odorem, materiæ in Leporino ventriculo contentæ simillimum.

A Puppy in the  
Womb, that  
receiv'd no  
Nourishment  
by the Mouth.  
by Mr. Brady,  
n. 304. p. 2176.

VII. The Puppy was whelp'd November 1704. had no Appearance of a Mouth at all, liv'd some time after it was parted from its Dam; pulling the Skin off its Head, which had not the least passage through it: The Head was one solid Bone, without Sutures, somewhat round, as a Man's Skull, with a little prominence in the fore-part, resembling the Os *Nasi* of a Man, but without any Passage: It had no Place for Eyes, nor *Meatus* for Ears, only the outward Resemblance of one on each side, unpenetrated and plac'd lower than naturally:



rally : No Jaw-bone, nor Conveyance to the top of the *Larynx* and *Pharynx*, but thence downward natural.

VIII. The Dam of a monstrous Calf was all that a poor Man had, who finding his Cow unable to cast her Young, employ'd his Neighbour to assist her; this Man not thinking of any such Rarity, us'd such Violence upon the Monster, that he disfigur'd the Head in pulling it from the Cow; notwithstanding it liv'd three Hours, and in all probability had lived till this time, if the Assistant had made use of the best Method in that case; then it dy'd, and being rip'd up was found, to the best of my Information, to be in all respects like any other of the same kind, excepting the Wings, which to me seem to be Bags formed out of the Membranes, torn and distended from the adjacent Parts, and by fresh supplies from the circulating Fluids were enlarg'd to a considerable Bigness.

*A monstrous Calf. by Dr. Adams. n. 315. p. 2414.*

IX. The Cow was very unthrifty, for which they gave her Cow Physick and such Drinks as they thought proper for her; notwithstanding which she grew worse, and continued a great while in a lean, pining, wasting Condition, and was reduc'd to so weak a State, that they believ'd she would die; when on a sudden, she began to eat her Meat, and thriv'd so fast, that in six or eight Months she was so fat as to be sold to the Butcher, who when he kill'd her, found Bones in her Uterus perfectly dry, there being no manner of Moisture in the Bag, as the Butcher call'd it, in which they were contain'd. The same Digestive Humour which dissolv'd the Skin, and Muscular parts of the Calf, might, (I presume) reasonably enough be suppos'd to dissolve the Cartilages, (and for ought I know) even Part of the Bones of a *Fœtus*.

*The Bones of a Fœtus in the Uterus of a Cow. by Mr. Sherman. n. 323. p. 450.*

X. A Butcher did this Morning bring me in the Head of a Calf (which he had taken out of a Cow's Belly.) The upper Jaw was divided into two halves, as far as to the *Dura Mater*: Each half had a distinct Eye and Nostril: And the under Jaw was bent round so entirely, that it lay exactly between the two Halves of the upper Jaw, making the Tongue lye upon the Forehead, about two Inches above the Teeth of the under Jaw, and in the Fissure of the upper Jaw. This preternatural Division of the upper Jaw was not covered with Hair, but with a *Cutis* of a florid Colour: The Calf was come to its full time, and made great Strugglings when the Butcher knock'd the Cow on the Head; which by some Symptoms they judg'd would have dy'd in the Calving. It was so large a Calf, that an old experienc'd Butcher says, That he never saw but one so large at Calving: The Legs and Feet were as big as a Calf of six Weeks old.

*A monstrous Head of a Calf. by Mr. John Craig. n. 333. p. 429.*

A full Week before the Cow was killed (upon apprehending she had a Dropsy) the Butcher cut a Hole in her Belly, a little above the



Udder, and thrust in his Hand; but finding nothing extraordinary, sowed up the Hole, and the Cow eat her Hay, and was as well as before. After we had cut the Skin of the Head (for there was no *Cranium*) that was expanded over the fore part of the Cavity containing the Brains, I was surpriz'd to find, that there was very little Brains in it; I am sure not so much as in a Rabbit: The whole Cavity is not big enough to hold an ordinary Walnut.

'A Contagious  
Distemper a-  
mong the Black  
Cattle in Italy,  
by Dr. Ramaz-  
zini. n. 338.  
p. 46.

XI. In 1711. A dreadful Contagion seiz'd the Black Cattle, which could not be stopt by Human Means. That it was in the Cow-kind is evident from the Coldness, Rigor and Standing up of the Hair at first, which was soon succeeded by a violent, sharp, Burning, with a quick Pulse. That this Fever was malignant, mortal and pestilential, the concomitant Symptoms shew'd; such as great Uneasiness with Difficulty of Breathing, great Pantings with a sort of snorting, and at the beginning a kind of *Stupor* and Drowziness, a continual Flux of a strong smelling Matter from the Nose and Mouth, a very foetid Dung, sometimes with Blood, all Rumination ceasing, Pustules breaking out over the whole Body on the 5th or 6th day, like the Small-Pox; they all generally dy'd about the 5th or 7th Day, very few of them escaping.

The Author deduces this Distemper from a contagious Original. He tells us, it is certain, that out of a great Drove, such as the Merchants bring yearly into *Italy* out of *Dalmatia* and the neighbouring Countries, one Beast happen'd to straggle from the rest, and be left behind; which a Cowherd finding, brought to a Farm belonging to the Illustrious and Reverend Count *Borromeo*, Canon of *Padua*: This Beast infected all the Cows and Oxen of the Place where he was taken in, with the same Distemper he labour'd under; the Beast itself dying in a few Days, as did all the rest, except one only, who had a Rowel put into his Neck.

'Tis no strange thing therefore, if from the *Effluvia*, like an Atmosphere, proceeding from the sick Cattle, from those dead, and from the Cowhouses and Pastures where they were fed, and by that means infected, and chiefly from the Cloaths of the Cowherds themselves, this Infection falling upon a proper Subject should diffuse itself so largely. When therefore this subtle venomous Exhalation happens to meet with any of the Cow-kind, joyning itself with the serous Juices and Animal Spirits, whilst it is carry'd all over the Body, it disorders the natural consistence of the Blood, and corrupts the Ferments of the *Viscera*; whence it naturally follows, that the natural Functions of the *Viscera* are vitiated, and the requisite Secretions stop'd. For

Dr. *Ramazzeni* not only supposes, but asserts, that this Poison is of that kind, which rather fixes and coagulates, than dissolves the Blood: For besides the forementioned Symptoms accompanying the Disease, the



the Eye it self is a Witness; since the dead Carcases being opened while they are yet hot, little or no Blood nevertheless runs out; those Animals having naturally a thick Blood, especially when the Fever has continued so many Days. Whether therefore this Plague came first from the foreign Beast, or any other way, it is the same thing, when at last it fell upon some Animal in which there was the morbid Seminary or Ground prepared for it.

In the dead Bodies of all the Cattle it was particularly observed, that in the *Omasus*, or Paunch, there was found a hard compact Body, firmly adhering to the Coats of the Ventricle, of a large Bulk, and an intolerable Smell: In other Parts, as in the Brain, Lungs, &c. were several *Hydatides*, and large Bladders fill'd only with Wind, which being open'd gave a deadly Stink; there were also Ulcers at the Root of the Tongue, and Bladders fill'd with *Serum* on the sides of it. This hard and compact Body, like Chalk, in the *Omasus*, the Author takes to be the first Product of the contagious *Miasma*. He adds a Prognostick, believing that from so many Attempts and Experiments, and the Method observ'd in the Cure of this Venom, at last a true and Specifick Remedy will be found out to extirpate the poisonous Malignity wholly: He also expects some Mitigation of it, from the approaching Winter and North Winds. He does not think this Contagion can affect Human Bodies, since other Species of ruminating Animals, symbolizing with the Cow-kind, are yet untouch'd by it; nor was the Infection catch'd from the Air, provided due Care was taken in burying the dead Bodies.

As for the Cure of it: For the Chirurgical Part he commends Bleeding, burning on both sides the Neck with a broad red-hot Iron, making Holes in the Ears with a round Iron, and putting the Root Hellebore in the Hole, a Rowel or Seton under the Chin in the Dew-laps; he also orders the Tongue and Palate to be often wash'd and rub'd with Vinegar and Salt. As for the *Pharmaceutical* Part; he recommends *Alexipbarmicks*, and Specifick Cordials; and from the *Vegetable Kingdom*, 3 Ounces of *Jesuits Bark*, infus'd in 10 or 12 Pints of Cordial Water or small Wine, to be given in four or five Doses; which is to be done in the beginning of the Fever when the Beast begins to be sick. From the Animal, two Drams of *Sperma Cæti* dissolv'd in warm Wine. From the Mineral, *Antimonium Diaphoreticum*. Against Worms breeding, an Infusion of Quicksilver, or *Petroleum* and Milk is to be given. And lastly, as to the Food, Drinks made with Barly or Wheat Flower or Bread like a *Ptisane*, fresh sweet Hay made in *May* and macerated in fair Water. In the mean time the Cattle must be kept in a warm Place, and cloath'd, to keep them as much as possible from the cold Air, daily making Fumigations in the Cowhouses with *Juniper Berries*, *Galbanum*, and the like. As to Prevention, he enjoyns Care in cleaning the Stalls, and scraping the Crust off from the Walls; Care also is to be taken of their Food, that it be good, the Hay and  
Straw.



Straw not spoil'd by Rain in the making, and judges their Food ought to be but sparing; Friction, rubbing, and currying, not only with the Hand, but with a Currycomb and Brush; with Setons under their Chin, made with a hot Iron run through the Part, and kept open with a Rope put through it.

A Medicine for a mortal Distemper amongst Cows: from Holland. ib. p. 50.

XII. Recipe *Veronica*, *Pulmonaria*, *Hysopi*, *Scordii*, ana M. iv. Rad. *Aris-tolochiae rotundae*, *Gentianae*, *Angelicae*, *Petasitidis*, *Tormentillae*, *Carlinae*, ana unc. 12. Bac. *Lauri* & *Juniperi*, ana unc. 12. Misc. fiat Pulvis.

Bleed the Cow, and give her every Morning for 3 or 4 Mornings an Ounce of this Powder with a Horn in warm Ale.

If the Cow's Illness continues, after the Omission of 2 or 3 Days, repeat the Medicine for 3 or 4 Days again.

Of the Distemper amongst the Cows near London. by T. Bates, Esq; n. 358. p. 872.

XIII. About the middle of July, 1714. the Distemper appear'd at *Islington*, and thereupon the Lords Justices were pleased to command, that I should examin into the Truth of the Report of its being contagious; and order'd the Lord *Harcourt*, then Lord Chancellor, to grant such Authority as would be proper to make such Discovery. Accordingly, Mr. *Milner*, Mr. *Offley*, Mr. *Richardson*, and Mr. *Ward*, four Justices of the Peace for *Middlesex*, were appointed to make the necessary Examinations.

Pursuant to those Orders, we went to *Islington*, where Mr. *Ratcliffe* had lost 120 out of 200; Mr. *Rufford* 62 out of 72; Mr. *Pullin* 38 out of 87. They were very unwilling to own it, because so soon as it should be known, no Body would buy their Milk: but Mr. *Ratcliffe*, a Man of good Judgment in Cattle, after much Persuasion, gave us the following Account, viz. that they first refused their Food: the next Day had Huskish Coughs, and voided Excrements like Clay; their Heads swelled, and sometimes their Bodies. In a Day or two more there was a great Discharge of a mucous matter by the Nose, and their Breaths smelled offensively. Lastly, a severe Purging (sometimes bloody) which terminated in Death. That some died in three Days, and others in five or six, but the Bulls lived eight or ten. That during their whole Illness, they refused all manner of Food, and were very hot.

We then advised with several of the Cow-leeches or Doctors, who all agreed, that it was a Murrain, or rather a Plague; and that the Methods they had try'd for a Cure, had proved unsuccessful. This Disease was so surprizing, that some of those Men who used to look after them, were afraid to go near them. We then ordered some of the sick Cows to be housed, and several sorts of Cattle to be kept with them, to see whether the Contagion would affect any other Species. Afterwards I drew up and gave the following Proposals to their Excellencies.

I. That



I. That all such Cows as are now in the possession of Mr. Ratcliff, Rufford, and Pullin, be bought, kill'd, and burnt: or, at least, that the sick be burnt; and the well kept and secured on the Grounds where they now are, that such of them as sicken or die of this Distemper may be burnt.

II. That the Houses in which those sick Cows have stood be washed very clean, and then smoaked by the burning of Pitch, Tarr, and Wormwood, and be kept three Months at least before any other Cows are put therein.

III. That the Fields where these sick Cows have grazed, be kept two Months before any other Cows are suffered to stand or graze thereon.

IV. That the Persons looking after such as are ill, should have no Communication with those that are well.

V. That the same Methods be observed if any other of the Cow-keepers should get this Distemper among them: and that they be all summoned and told, that as soon as they perceive any of the Cows to refuse any of their Meat, or have any other Symptoms of this Distemper, that they immediately separate them from the others, and give notice to such Persons as your Excellencies shall appoint, that they may be burnt; and the Places where they have stood or grazed to be ordered as before.

VI. That the Cow-keepers be required to divide their Cows into small Parcels, not more than ten or twelve in a Field together; and that they be allowed such Satisfaction for complying with these Proposals, as your Excellencies shall think fit; all which is most humbly submitted, &c.

The Gentlemen then by Command from the Lords Justices, summon'd all the Cow keepers in the Country, and acquainted them with the abovenamed Proposals to most of which they readily complied, as being visibly their Interest; and offered them Forty Shillings for every Cow which they burnt, that had not been sick above twenty four Hours; but for such as had been longer ill, or were dead, they would allow them only the value of their Skins and Horns.

Some of the Cow-keepers appeared not content with this Regulation, and believing that the Disease would become general, design'd to have sold their Cows at some distant Market; which the Gentlemen having notice of, appointed several Butchers to watch near their Grounds, and count their Numbers every Morning, with Orders to follow such as they sent to any Market to prevent their being sold, by telling the People what they were. Another great Obstacle at the first was the Cow-keepers not owning the Disease, till they had lost several of their Cows; for so soon as it was known that any Man had but one sick, none would buy his Milk; and to those who kept many Cows, that Loss was considerable, Nor was there ever wanting one or other who gave them hopes of a Cure.

To



To obviate these Difficulties, the Gentlemen encouraged them to hope for a Brief, but assured them that such only as complied with these Directions, should have any Benefit by it. Accordingly, they ordered a daily Account to be taken of the Conduct of each Cow keeper, and allowed or disallowed their pretensions to this Brief, as well as to the Forty Shillings *per* Cow, as they complied or disregarded these Directions. This had pretty good Effect.

I had Orders from the beginning to assist these Gentlemen with my Advice, which I did at most of their meetings; as also to make a stricter Enquiry into the Disease by Dissections, &c. Accordingly I discoursed the Cow-leeches about the Customs and Diseases that Cows were subject to, and consulted such Books as treated of them; but concerning this Disease, I could gain but small Assistance from either. I then made Dissections of sixteen Cows, in different degrees of Infection; and found the Putrefaction of their *Viscera* to encrease, in proportion to the time of their Illness.

The first five that I opened, had herded with those that were ill, and the Symptoms of this Distemper were just become visible; in these, the Gall-bladders were larger than usual, and filled with Bile of a natural Taste and Smell, but of a greener Colour. Their *Pancreas*'s were shrivelled, some of the Glands obstructed and tumified. Many of the Glands in their *Mesenterys* were twice or thrice their natural bigness. Their Lungs were a little inflamed, and their Flesh felt hot. All other Parts of their *Viscera* appeared as in a healthful State. The next six that I opened, had been ill about two Days; in them the Livers were blacker than usual and in two of them, there were several Cyfts filled with a Petrified Substance like Chalk, about the bigness of a Pea. Their Gall-bladders were twice their usual bigness, and filled with Bile of a natural Taste and Smell, but of a greener Colour than the first. Their *Pancreas*'s were shrivelled, some of their Glands very large and hard, and of a blackish Colour. The Glands in their *Mesenterys* were many of them five times their natural bigness, and of a blackish Colour. Their Lungs were inflamed, with several small Cyfts forming. Their Intestines were full of red and black Spots. Their Flesh was very hot, tho' not altered in Colour. The five last that I opened, were very near dying; in them I found the Liver to be blackish, much shrivelled and contracted, and in 3 of them, there were several Cyfts as big as Nuts or Nutmegs, filled with a petrified Substance like Chalk. Their Gall-bladders were about three times their usual bigness, and filled with a Bile of a natural Taste and Smell, but of a deep green Colour. Their *Pancreas*'s were shrivelled and contracted, many of their Glands very large and hard, and of a black Colour. The Glands in their *Mesenterys* were many of them distended to eight or ten times their Natural bigness, were very black, and in the *Pelvis* of most of those Glands in two Cows, there was a yellow Petrefaction, of the consistence of a sandy Stone. Their Intestines were the Colour



Colour of a Snake, their inner Coat excoriated by Purging. Their Lungs were much inflamed, with several Cyfts, containing a yellow purulent matter, many of them as big as a Nutmeg. Their Flesh was extream hot, though very little altered in Colour.

The following Cases being very extraordinary, I could not omit the mention of them, *viz.* In one of them the Bile was petrified in its Vessels, and resembled a Tree of Coral, but of a dark yellow Colour, and of a brittle Substance. In another there were several Inflammations on the Liver, some as large as half a Crown, cracked round the Edges, and appeared separating from the sound Part, like a Pestilential Carbuncle. In a third, the Liquor contained in the *Pericardium* (for Lubricating the Heart in its Motion) appeared like the Subsidings of *Aqua Calcis*; and had excoriated, and given as yellow a Colour to the whole Surface of the Heart and *Pericardium*, as *Aqua Calcis* could possibly have done.

In giving my Opinion of this Distemper, I must beg leave to premise, that all Cows have naturally a Purgation by the *Anus* for 5 or 6 Weeks in the Spring, from (as the Cow-keepers term it) the Firmness of the Grass; during which time they are brisk and lively, their Milk becomes thinner, and of a blewish Colour, sweeter to the Taste; and in greater Plenty: but the Spring preceding this Distemper, was all over *Europe* so dry, that the like has not been known in the Memory of any one living; the Consequence of which was little Grass, and that so dry and void of that Firmness which it has in other Years, that I could not hear of one Cow-keeper, who had observed his Cows to have that Purgation in the same degree as usual; and very few who had observed any at all. They all agreed that their Cows had not given above half so much Milk that Summer as they did in others; that some of them were almost dry; that the Milk they did give was much thicker, and yellower than in other Years. It was observed by the whole Town, that very little of the Milk then sold would boyl without turning; and 'tis a known Truth, that the weakest of the common Purges you can give a Cow entirely takes away her Milk; from all which Circumstances I think it evident, that the want of that natural Purgation was the sole Cause of this Disease; by producing those Obstructions, which terminated in a Putrifaction and made this Distemper contagious. Cows are likewise subject to a Purgation (though in a less degree) from the same Quality in the Grass, about the latter end of *September*; which is called the latter Spring; and which I believe contributed not a little to the preventing the encrease of this Distemper; for this Purgation coming so soon after the Disease appeared, it is not unreasonable to suppose, that it freed such Cows as were not much injured, from the ill Effects of those Obstructions; occasioned by the want of their Vernal Evacuations.



\* *vid. supra*,  
p. 342.

Several Physicians attempted the Cure, and made many Essays for that purpose ; but the Dissections convinced me of the Improbability of their succeeding, with which I acquainted their Excellencies. However they having received a *Recipe* \* and Directions from some in *Holland*, said to have been used there with good Success, gave me Orders to make Tryal of it : But in very many Instances, I was not sensible of the least Benefit. I think there is no one Method in Practice, but what was tryed on this occasion, though I cannot say that any of them was attended with appearance of Success ; except that of Bleeding plentifully, and giving great Quantities of Cooling and Diluting Liquids. But by this Method, the Instances of Success were so few, that they do not deserve any further mention.

Their Excellencies being informed that the feeding the Cows with Distillers Grains was a new Custom, and was the Cause of this Disease, gave me Orders to examine into the Truth of it ; but upon enquiry, I found it to have been the Practice of several of the Cow-keepers above twenty Years, without the least appearance of any Inconvenience ; and that some of those Persons who had suffered most, had never any. Nor is there any Difference between those of Brewers and Distillers, only that the latter are the dryer. It was likewise said, that the want of Water was the Cause of this Disease, for that the Springs and Places where People used to water their Cows, were almost every where dry ; and that many were obliged to send them several Miles for Water. This might produce some Diseases, but such only as they got by the Fatigue of being driven so far ; for Mr. *Ratcliff*, Mr. *Rufford* and Mr. *Pullen*, the three Persons where this Disease first appeared, had the New River Water running through the very Grounds where their Cows constantly grazed, and could drink at their Pleasure, and so had most of the Cow-keepers at *Islington*.

About the latter end of *September*, the Disease increased, and the Numbers brought to be burnt were so great, that it could not be well executed ; therefore it was judged proper only to bury them fifteen or twenty Foot deep ; but first to make large Incisions in their most Fleshy Parts, and to cover them with Quicklime. In the beginning of *October*, being informed that some of the Cows in *Norfolk*, *Suffolk*, and *Hertfordshire*, had got this Disease, and apprehending that it would become general ; I gave in the following Report to a Committee of Council.

The Distemper among the Cattle encreasing, and beginning to appear in several Counties, I thought it my Duty to acquaint your Lordships, with the hazard that may attend their not being duly buried. It is the Opinion of all Authors in Physick that treat of contagious Diseases, as well as of several of the Physicians in Town, that a Putrifaction of so many Cows as there is reason to fear will die of this Distemper, may produce some contagious Disease among Men ;  
unless



unless they are buried so deep that the infectious *Effluvia* cannot injure the Air, which I am certain has very seldom been complied with, except in the Counties of *Middlesex*, *Essex*, and *Surry*, the Gentlemen employed being capable of acting in those Counties only. It is affirmed by several now living, that there was a Mortality among the Cattle, a little before the last Plague in the Year 1665, which was imputed to the want of a due care in burying them. And your Lordships may know of what importance it was judged by the King of *Prussia*, the States of *Holland*, and several other Princes and States, by the care they took to publish Decrees and Placarts, commanding them to be buried upon pain of Death, or other severe Penalties; and I humbly conceive it would be necessary, not only to bury those which shall die, but that all such as are already dead may have the same care; as also that they be buried nine or ten Foot deep at least. All which is most humbly submitted, &c.

Their Lordships thought fit to defer all proceeding upon this Report, till the Distemper becoming more general should make it necessary; but I thank God that Necessity never happened, for within 3 Weeks or a Month after the giving in of that Report, the following Particulars concurred to put an end to the Disease.

The Cows began their latter Purging, which contributed much to prevent the Disease from appearing in fresh Places; and the Cow-keepers were convinced that the Disease was incurable. The Knowledge of the Disease was spread all over *England*, so that none would buy a Cow in the Country; and the Gentlemen prevented their being kill'd in Town, by having the Markets examined daily; and such Meat condemned as appeared suspicious. They now divided their Cows into small Parcels, by which they lost only that in which the Disease happened; whereas before that Method, when one Cow got this Disease, if she had herded with one, two, or three hundred (the Contagion was such) scarce one escaped. Those who had no sick Cows avoided all Communication with such as had. They likewise found that the keeping their Cows so long when ill, had been the chief Cause of their Loss; they therefore now brought them to be buried on the first Appearance of the Disease, before the Contagion could possibly have got to any great Height.

The Severity of this Disease in *England* did not last above three Months; though it was not entirely suppressed till about *Christmas*: But in several other Countries it continued two or three Years; and I am credibly assured, that in *Holland* it now rages with as much Violence as ever; and that they have lost in Cows, Oxen and Bulls above three hundred thousand.

The Providence of God has so disposed the Matter of Animal Bodies, as to render contagious Diseases very seldom infectious to different Species; but Experience demonstrates that Contagions may be communicated to the same Species, by touching the Woollen, Lin-



nen, &c. to which the infectious *Effluvia* of the Diseased had adhered, tho' the two Bodies should be at a very great distance; and I verily believe that more Hundreds died from the Infection, which was carried by the Intercourse that the Cow-keepers had with each other, than single ones by the original Putrifaction.

The number of Bulls and Cows lost by this Disease, in the Counties of *Middlesex, Essex* or *Surry*, were Five Thousand Four Hundred and Eighteen; and of Calves, Four Hundred and Thirty Nine; and the Money issued for them, at Forty or Ten Shillings *per Cow*, &c. was the Royal Bounty of His Majesty, from his own Civil List: and tho' neither the four Gentlemen, nor I, made any demand for a Reward, or for Expences, yet it amounted to 6774*l.* 1*s.* 1*d.* But the entire loss to the Cow-keepers, as delivered in upon Oath, was 24500*l.* (exclusive of the 6774*l.* 1*s.* 1*d.*) tho' computed but at Six Pounds *per Cow*; which at a Medium was not more than their prime Cost; the dearness of keeping them near *London* necessitating the Cow-keepers to buy the very best.

*A Worm in the  
Head of Sheep,  
by Dr. Thorpe.  
n. 295. p.  
1800.*

Plate 12.

XIV. I send you a Delineation of a Worm found in dissecting the Head of a Sheep, in the Cells form'd between the *Laminæ* of the *Os frontis*. It is an *Apode*, and seems to be a Species of the *Eulæ*, tho' much different from the common sort breeding in putrid Flesh. 'Tis every where of a fair pale colour, excepting its Tail, which ends a little obliquely in a Plane; on which are impress'd 2 remarkable black Spots (as in *Fig. 12.*) Besides two small white *Corniculæ*; its Head is arm'd with a pair of black sharp and crooked Forcipes, which in contracting and extending its body, it draws in and puts out at pleasure: with these in creeping it takes hold on the Surface of the Body, on which it moves, and draws itself forward, on pretty large protuberant, and somewhat flattish *toruli*, fewer in Number than those on its back (*v. Fig. 13.*) which alternately swell'd and relax'd, seem instrumental to its motion, and supply the place of Feet. It looks of a clear, Chrystalline substance, and almost transparent.

The Membrane, that invested the Cavity of the Cells containing it, was very fat, and in most places separated from the Bone; the Blood-Vessels appear'd turgid, and inflam'd: Whereas the Membrane of the opposite Cells, which have no Communication with these, was thin, pellucid, adherent, and no ways preternaturally affected.

I have given the more particular description of this Worm, and the Cells it was found in, it not being describ'd by any Author I have yet consulted. Mr *Bobart* informs me, 'That some curious Gentlemen of the University lately observ'd three Worms lodg'd in the same parts of the Head of a Sheep, but in two distinct Cells: The largest apart by its self, the other two in the Cell adjoining; one of which was considerably less than the other, agreeing in form with the forementioned, of a whitish colour in general, with the two

[ nota-



notable Spots on the flat of the posterior part, but a shadow of brown-  
 nels from the back down the sides, (especially of the riper one;)   
 roundly turgid on the back, and flat underneath; divided with several *annuli*, as these Creatures generally are; at the extremity of  
 which Protuberances, serving instead of Feet, there appears a little  
 darkish brown spot on each side or edge: as they faded and wither'd  
 they chang'd to a light red or phoenicious colour, and afterwards  
 brown.

XV. In a Sheep's Kidney I found a large whitish Body inclining to yellow, and ting'd with Red, as it lay under the Membrane of the Kidney, *v. Fig. 14 A.* This was very hard, as is usual in Animal Petrifactions; 2 thirds of it lay hid within the Substance of the Kidney. It was inclos'd with a thick Membrane, which could not easily be separated from it, even with a Needle flat in the end of a Stick. The Branches of the emulgent Veins and Arteries lay between it, and the Pelvis of the Kidney; all which Vessels were somewhat prest by this petrified Body. As I was picking off its thick strong Membranous Inclosures, I found the Needle slip into a Cavity at an Aperture *Fig. 4.* By this I was inform'd (of what I confess I had no Suspicion) that this hard and heavy petrifi'd Body was hollow, whereupon I thought of dividing it with a Saw, but finding a Membranous Interstice in it, *Fig. 15. B.* I pulled it asunder as exprest *Fig. 16.* and found its inside divided by many petrified Shells *C.* of irregular Figures, and fill'd with *Hydatides*, some of which are represented at *D.*

*of Hydatides  
 inclos'd in a  
 Sheep's Kidney.  
 by Mr. Cow-  
 per. n. 307. p.  
 2304.*

*Plate 12.*

*Fig. 14.* The external Surface of a Sheep's Kidney. *A* the petrified Body as it appeared in it before Dissection.

*Plate 12.*

*Fig. 15.* The interior Surface of the same petrified Body, after the Membrane that inclos'd it was taken off. *a* The Hole by which 'twas discover'd to be hollow. *B* The Fissure by which 'twas divided to shew its Inside exprest

*Fig. 16. C.* Its petrified Shells that contained the *Hydatides* of various Sizes and Figures, exprest at *D* when taken out.

XVI. The Heart in this Animal is situated in the anterior part of the capacity that maketh the *Abdomen*, separated from all the other *Viscera* by a large *Pericardium*, which encloseth it. This *Pericardium* is fastned by its superior part to the Spine of the Back, by the anterior to the Muscles of the Neck; which is the cause that the Heart moveth forward when the Animal putteth forth his Head out of the Shell, and backward when he draws it in: By the *Inferior* part it adheres to the *Peritoneum*, which is fastned to the lower Shell; so that by all these Ligaments the *Pericardium* is kept distended sufficiently, that the Heart hath an entire liberty in it. In this *Pericardium* there is found a good quantity of a very clear and transparent Water, which hath the same use there, as that which is found in the *Pericardium* of other Animals.

*The Hoart of an  
 American  
 Land Tortoise  
 anatomically  
 describ'd by Mr  
 Buffiere. n.  
 328. p. 170.*

'Tis



'Tis in the middle of this *Pericardium* that the Heart is suspended ; to wit, at its *Basis* by the Arteries, and at its inferior part by a little Tendon, or a very thin Ligament, which from the Point or Cone of the Heart, ascended to insert it self to that part of the *Pericardium* which adheres to the Back. This little Ligament is very remarkable in this, that by its means the Point of the Heart is suspended on the Level of its *Basis* ; without which 'tis visible that the Point of the Heart would fall lower, and bend the Vessel of the *Basis*, which might have interrupted the free Circulation of the Blood, and by consequence would have endanger'd the Life of the Animal. The *Pericardium* being opened, the Heart appeareth as if it was standing by itself, being only fix'd to the Arteries which go out of it (supposing the Animal turned upon its Back) its Auricles being separated and hid under its *Basis* and Arteries, towards the Back of the Animal ; which is very different from the Sea Tortoises, where the Auricles are situated on the Right and Left Angle of its *Basis*, by which way they push the Blood into the Heart.

The Figure of the Heart of this Animal is almost lenticular ; making nevertheless three obtuse Angles, two on the *Basis*, one to the Right, and the other to the Left ; the third is at the Inferior part, where the little Tendon, which suspendeth the Heart on the Level of its *Basis*, is inserted. If this Animal be opened alive, you have the satisfaction to see the Circulation of the Blood, by reason of the transparency of the Membranes of the Veins, and the Alternative Motions or Dilatations of the Heart and Auricles, and the Arteries and Veins, which are very slow in this Animal.

From the *Basis* of the Heart pass out four great Arteries, that appear distinctly separated one from the other ; whereas in that of the Sea Tortoise, these Arteries are involved, for the length of an Inch, in a *capsula* common to them all, which maketh them to appear as if they were but one Trunk. If these four Arteries be entirely cut, the Heart is no more suspended, but by the conjunction of the two *Musculous* Conduits of the Auricles, which pierce the Heart in its *posterior* part, towards the middle of the Heart, on the Left side ; by which the Blood runneth from the Auricles into the Ventricle of the Heart. These Arteries being thus divided, and the Heart turned over, the Auricles appear lying transversely against the Back, in the capacity of the *Pericardium* : They make but one continued fleshy Body, a little extended, about two thirds inclining to the Left side. 'Tis in this Body that the Cavities of the Auricles are separated the one from the other, by a *muscular Septum*, situated Internally to that Place, which appears contracted Externally. These Auricles make a *muscular* Production about six Lines long, which uniteth them to the Heart, towards the middle and left of its backside. This Production is composed of two Conduits separated only from one another by the Extension of the *Septum*, which divideth the two Auricles : It is by these two Conduits that the Blood floweth



floweth from the Auricles into the Heart. The Body of these Auricles hath no adherence to the *Pericardium*, nor any support but that of the Veins, which end in it; for if you divide these Veins, the Heart and Auricles come out of the Body; and then if you suspend the Heart by the Auricles, they resemble two Funnels joyned together, the little end of which opens into the Ventricle of the Heart, to pour the Blood into it: And 'tis in this manner we are to conceive them, in the Natural Situation of the Animal.

After having thus considered the External Parts of the Heart and its Auricles, we are to proceed to the Examination of the inside of both of them. In order to that, it must be opened at its inferior Surface, (supposing the Animal turned upon its Back) because all the Orifices of either the Arteries and Veins, and their Valves, are in the opposite side: Therefore a Probe may be introduced through one of the Arteries into the Heart, and it opened upon it; after that, you cut all this side round about the Inferior Circumference, from one Angle to the other, and then turn over all that part which is cut on the *Basis* of the Heart: For then it is easy to remark and view all the Internal Parts of an Heart, and observe that there is but one sole Ventricle, which comprehends the whole extent of the Heart, and is as uniform and plain as either of the *Ventricles* of the Human Heart, or of any other Animal whatsoever; and that is impossible to remark any kind of *Septum*, either Musculous or Membranous, that might make any Division or *Cellule* in this *Ventricle*: And 'tis very surprizing, that the Anatomists of the Royal Academy of *Paris* have shewn, the one three, and the other four *Ventricles*, in the Heart of a Land Tortoise of *America*.

After having considered the Extent of the Cavity of the Heart, there remain two things to be examined. The first is, that in its back part there are five Holes or Orifices, two whereof are on the left Side: These are the Orifices of the two Funnels of the *Auricles*: They are covered by a large *Valve* lying flat upon them, supported in its middle by the Prolongation of the *Septum*, which divides the *Auricles*, in such a manner, that half of it covers the Orifice of the right *Auricle*, and the other half that of the left; so that this *Valve* resembles two folding Doors of a Porch, which have the same support, and whereof one opens or shuts to the right, and the other to the left. It is visible, that this *Valve* permits the Entrance of the Blood into the *Ventricle* of the Heart, but opposes its return into the *Auricles*; because this Blood, being once in the Heart, presses by its own Weight upon this double *Valve*, and keeps it close and flat upon these Orifices: Which confirms perfectly well the Office of the *Valve*, which is in the *Foramen Ovale* in the Heart of an Human *Fetus*, the Disposition being entirely the same. The other three Holes lying on the right Side of the *Ventricle* of the Heart, are the Orifices of the four Arteries which come out of the *Basis*: Of these three Holes, that which is the most left is the Orifice



Orifice of the Pulmonary Artery ; that which is the highest, is the Orifice of the *Aorta sinistra descendens* ; and that which is most to the right Side, is common to the *Arteria Aorta dextra*, and to the *superior Aorta*. Each of these Orifices is furnished with two Semilunary *Valves*, which permit the Blood to pass without difficulty from the *Ventricle* of the Heart into the Arteries, but hinder its return into the Heart. 'Tis a pure Illusion, to place these Holes in different *Ventricles* ; they are all in one and the same Cavity ; so that the Blood enters into this only Cavity, by the two Holes which are on the left Side, and goes out of this same *Ventricle*, by the three Holes which are on the right Side.

The second thing remarkable in this Ventricle is the Fibres of the Heart. They are of 2 sorts ; some are External, disposed under the common Membrane in several Plans, very small, but obliquely circular, extending from the *Basis*, but particularly about the Arteries, which serve them instead of Tendons or Points of Support, towards the inferior Circumference of the Heart : The other Musculous Fibres which compose the Heart, are in the manner of several Columns, as those of the Human Heart ; they are situated internally in both sides, lying obliquely from the Right, where their Tendons are about the Arteries, to the left ; which demonstrates that their Action is from the left to the right Side, where the Orifices of the Arteries lie open, to let the Blood pass out.

It has been said before, that the two *Auricles* of the Heart of the Land Tortoise of *America*, make externally but one continued Body ; but that it has internally two Cavities, separated from one another by a Musculous *Septum*. This *Septum* separates them so exactly, that there is not the least Communication of the one with the other ; so that the Blood of either *Auricle* does not mix with that of the other, but in the Ventricle of the Heart. The Right Auricle is as big again as the Left ; all the Blood of the Animal (that of the Lungs excepted) passing through it to go into the Heart ; the left Auricle receiving only the Blood which cometh from the Lungs, the Pulmonary Veins being very small. The internal Part of the *Auricles* are furnished with little Musculous Columns, but particularly at their Extremities, situated in such a manner, that it is visible their Action tends to push the Blood against the *Septum*, where the Conduits, which convey it into the Heart, are situated.

There is in the bottom of the right Auricle an oblong Orifice, by which the Blood cometh into its Cavity from the great Reservoir of the Veins, situated on the back part of the Heart. This Orifice is furnished with two Semilunar oblong *Valves*, disposed in such manner, that when the Auricle is relaxed, the Blood enters its Cavity, but when contracted, they shut close to hinder the Blood from returning into the Veins : The Orifice of the Funnel, or the Conduit into the Heart, is to be seen against the *Septum*. The left Auricle hath exactly



exactly the same Structure as the right: 'Tis in the bottom of this Auricle, that the Orifice, common to the two Pulmonary Veins, is to be observed furnished with two Semilunar *Valves*; and against the *Septum* to the Right, that the Funnel or Conduit into the Heart is situated, joining with the Funnel of the right Auricle. These two Conduits are separated from one another by the continuation of the *Septum*, which divides the Auricles to the very *Ventricle* of the Heart, and is as a support to the double *Valve* which covers their Orifices in the Heart.

It has been said before, that from the Basis of the Heart of the Land Tortoise of *America* there goes out four great Arteries. Of these, the first which presents itself, (the Tortoise being turn'd upon his Back) <sup>Of the Vessels of the Heart.</sup> is the Pulmonary Artery: It is more on the Left Side than the others, and is much bigger for the space of an Inch; then it divides it self into two Branches, the most apparent whereof cometh from the right Side of its Trunk, and turns it self over towards the Left Side, accompanying the *Aorta inferior sinistra*, till it hath pierced the *Pericardium*; after that it unites with the left Branch of the *Trachea Arteria*, which it accompanies through all the Extent of the left Lobe of the Lungs. The other Pulmonary Branch, going out of the left Side of its Trunk, turns it self over immediately cross upon the other Arteries, from the Right to the Left, to joyn the *Aorta inferior dextra*, till it has pierced the *Pericardium*, where it joyns to the right Branch of the *Trachea Arteria*, which it accompanies through the whole Extent of the right Lobe of the Lungs.

One thing seems to me very remarkable in this Pulmonary Artery; it is this, that though its Trunk, in going out of the Heart, hath more than twice the Diameter of the *Arteria Aorta sinistra*, yet the two Branches which it sends to the Lungs, have not either of them one third of the Diameter of the *Aorta sinistra*. In the Arteries, which I have fill'd with Wax, the Trunk of the Pulmonary Artery hath between seven and eight Lines Diameter; the *Aorta sinistra* four and a half; and the Pulmonary Branches after having pierced the *Pericardium*, have not either of them but one Line and a half Diameter: Nevertheless this Artery doth not produce any other Branch; all the Blood which enters from the Heart into its Trunk, is carried into the two Lobes of the Lungs, and no where else. The reason of such Disproportion I cannot guess; but this is matter of Fact, since it is the same in all: Nevertheless, if I may be permitted to conjecture, it seems to me that it may be attributed to the Alteration that happens to the Branches of the *Trachea Arteria*, when the Tortoise stretcheth forth his Head out of the Shell; for these Pulmonary Branches making an half Circle before they joyn with the *Trachea Arteria*, when the Animals Head is drawn in; the Extension which happens to the Branches of the *Trachea Arteria* when the Animal goes out of the Shell; turns these half Circles into sharp Angles; insomuch, that thereby the Passage of the



Blood is somewhat interrupted, and consequently the Blood, which passes continually from the Heart into the Trunk, not being capable to return back, because of its Valves, must of necessity dilate this Trunk more than the other Arteries, in which the Blood passes in an equal Passage. And that which persuades me that there doth not go into the Lungs of this Animal, more Blood than that quantity which the Pulmonary Branches can admit by their small Diameter, and not the quantity which the Diameter of their Trunk could furnish, is, that the Pulmonary Veins, which bring back all the Blood of the Lungs into the left Auricle of the Heart, have not either of them entirely two Lines Diameter, which is proportionable to the bigness of the two Pulmonary Branches of the Arteries.

The second Artery which goes out from the *Basis* of the Heart, is that which I call *Aorta sinistra*: It ascends as it comes out of the Heart, together with the left Pulmonary, till they have pierced the *Pericardium*; after which it makes a large turning, without any support, towards the left Side, which gives it the Liberty to extend it self when the Animal stretches out of its Shell, and to refold it self, when it retires into it; after that, this Artery descends against the Back, where it gives some small Branches to the *Medulla Spinalis*; after that it returns through the Lungs into the *Abdomen*, and it is here that it produceth a considerable Branch, which divides into two; of which one is distributed to the Liver, the Stomach, and the Intestines, and the other turning towards the Right in the middle of the *Abdomen*, unites to the *Aorta dextra*; so that these two Arteries are but one and the same Branch divided into two. This same *Aorta sinistra* continues afterwards to the lower Belly, to be distributed to the Kidneys, Thighs, and the Parts that are below. This left *Aorta* is much longer than the right, because of the great Circle it makes when it cometh out of the Heart, to accommodate it self to the Motions of the Animal, and to make room for its Head, which is placed under this Artery in the left Side, when he draws it into his Shell: And 'tis for that reason that the left Branch of the *Trachea Arteria* is longer than the right. This Artery is also bigger than the right *Aorta*, because that it furnisheth a greater number of Parts with Blood. It hath a distinct Orifice into the Ventricle of the Heart, and hath not the least Communication with the Pulmonary Arteries, neither in the Heart, nor any other Part. This does not resemble at all to the *Ductus Arteriosus*, or as a certain Modern is pleased to call it, the Canal of Communication, in the Heart of an Human *Fœtus*.

The third Artery going out from the *Basis* of the Heart of this Animal, is that which I call *Aorta descendens dextra*: After having pierced the *Pericardium* it sinks towards the Back; then returning through the Lungs into the *Abdomen*, where it receives the Branch of the *Aorta sinistra*, it is distributed to the right Kidney, Thighs, Bladder, and Parts of Generation: So that I call these two Arteries *Arteriæ Aortæ descendens*.



*descendentes*, because they distribute the Blood of all the inferior Parts of this Animal, the same as the *Aorta descendens* doth in all other Animals.

The fourth Artery going out from the Heart, is the *Aorta ascendens*. It hath an Orifice in the Ventricle of the Heart, common with the *Aorta descendens dextra*: It appears in part under the *Aorta sinistra* coming out of the Heart, and ascendeth in a strait Line till it hath pierced the *Pericardium*; after which it divideth into three principal Branches, whereof the two lateral go to the fore Legs, and make the Carotid; the third ascends all along the *Trachea Arteria* towards the *Larynx*, and gives Branches to all the Parts of the Neck.

The Disposition of the Arteries which go out of the Heart being examined, there remains only the Veins which bring the Blood into it from all the Parts of the Animal: But first one must observe, that there is no Veins which terminate in the Heart; for all the Veins open themselves into the Auricles, which are, as hath been said, separated from the Heart. There are two ways to show these Veins without Dissection: The first is to fill them with Wax, by syringing it into them by their Orifices in the Auricles; for if one syringeth by the oblong Orifice in the *Auricula dextra*, all the Veins of the Body (except those of the Lungs) will be entirely fill'd; and afterward by syringing into the Oval Orifice in the *Auricula sinistra*, the two Veins of the Lungs will be full at once through the whole Extent of the *Trachea Arteria* in the Lungs. The other way is to wait till the Animal is expired; because the Heart losing insensibly its Vigour, (it beating for the space of twenty four Hours,) it has not then the Force to discharge it self of the Blood which comes from all Parts into these Veins, which then grow very turgid by the coagulated Blood collected in them: Then you need only to turn over the Heart towards the Neck, cutting only the little Coronary Vein which comes out of the Substance of the Heart, for to observe all the great Veins without Dissection; because they all come and end in a common Reservatory, situated across in the capacity of the *Pericardium*, joining to the Auricles. And here one may observe a great Vein, or an irregular Reservatory: In the Tortoises I have dissected of 18 and 20 Inches long, this Reservatory was 10 Inches broad, and 18 Inches long. In this Reservatory the two Axillary Veins which come from the upper Parts of the Body, joyn one another, after having pierced the *Pericardium*, one on the right side, and the other on the left. From the inferior Parts there joyn two large Veins, one on the right side, and the other on the left of the inferior Part of this Reservatory; the first whereof is made up of all the Branches which come out of the right Lobe of the Liver, which is very big; and the other consists not only of the Veins of the left Lobe of the Liver, but also of a Vein which supplies the place of the *Vena Cava*, and which I call the *Vena intestinalis*, because after it has received all the Veins of the inferior Parts of the Animal, it runs all



along the Intestines, from which it receives the Veins ; and being arrived at the *Pylorus*, it passes cross the Left Lobe of the Liver, and terminates in the common Reservatory.

Besides these four great Veins, there are three, and sometimes but two, coming from the middle part of the Liver, which are inserted into the bottom of the Reservatory ; as also the little Coronary Vein from the Heart. All these Veins being thus re-united in one common place, this Reservatory terminates upwards in a Conduit, which is inserted into the posterior part of the right Auricle, and opens into its Cavity by an oblong Orifice, furnished with two long semilunar Valves, which permit the Blood of the Reservatory to enter into the Auricles, but hinder its returning from the Auricles into the Reservatory.

A little above the Reservatory, under the left Auricle, the two Pulmonary Veins are seen : The left, after having entered the *Pericardium*, is hid under the axillary Vein, and does not separate itself from it but a little above the Auricles ; from thence it bends to go and insert itself into the posterior Part of the Auricles. The right Pulmonary Vein follows after the same manner the right Axillary, which it quits after it has entered the *Pericardium*, to traverse almost all the length of the Reservatory, and meet the left Pulmonary about two Lines distance from the Auricles. These two Veins thus united, open themselves in the posterior Part of the *Auricula sinistra*, by a common Oval Orifice furnished with two Semilunar Valves ; by which means they pour into this Auricle all the Blood that comes from the Lungs to the Heart.

By all that has been observed upon the Structure of the Heart of the Land Tortoise of *America*, and the Disposition of both its Auricles and Vessels, how extraordinary soever it may appear, it is impossible to find out the least thing which may injure the Opinion of Dr. *Harvey*, and all other Anatomists, about the manner that the Blood circulates in the Heart of an Human *Fœtus*, and the use of the Valve which is at the *Foramen Ovale* ; which is to permit the Blood to pass from the right Auricle through this Hole into the left, and to hinder the Blood's passing from the left Auricle by this Hole into the right. And I add farther, that amongst all the known Animals, one could not chuse one whose Heart may be more proper to confirm this Opinion, than the Land Tortoise of *America*, by reason of the Simplicity of its Structure, and of the plain and distinct manner in which all the Parts appear.

An Explanation  
of the  
Figures.  
Plate 14.

Fig. 1. *a a a* The Heart. *b b b* Its Auricles. *c* The Trunk of the Pulmonary Artery. *d* The *Arteria Aorta descendens sinistra*. *E* The *Arteria Aorta superior*. *H* The *Arteria Aorta descendens dextra*. *F* The Ligament that suspendeth the Cone of the Heart in the *Pericardium*. *G G G G* The *Pericardium* opened.

Fig 2.







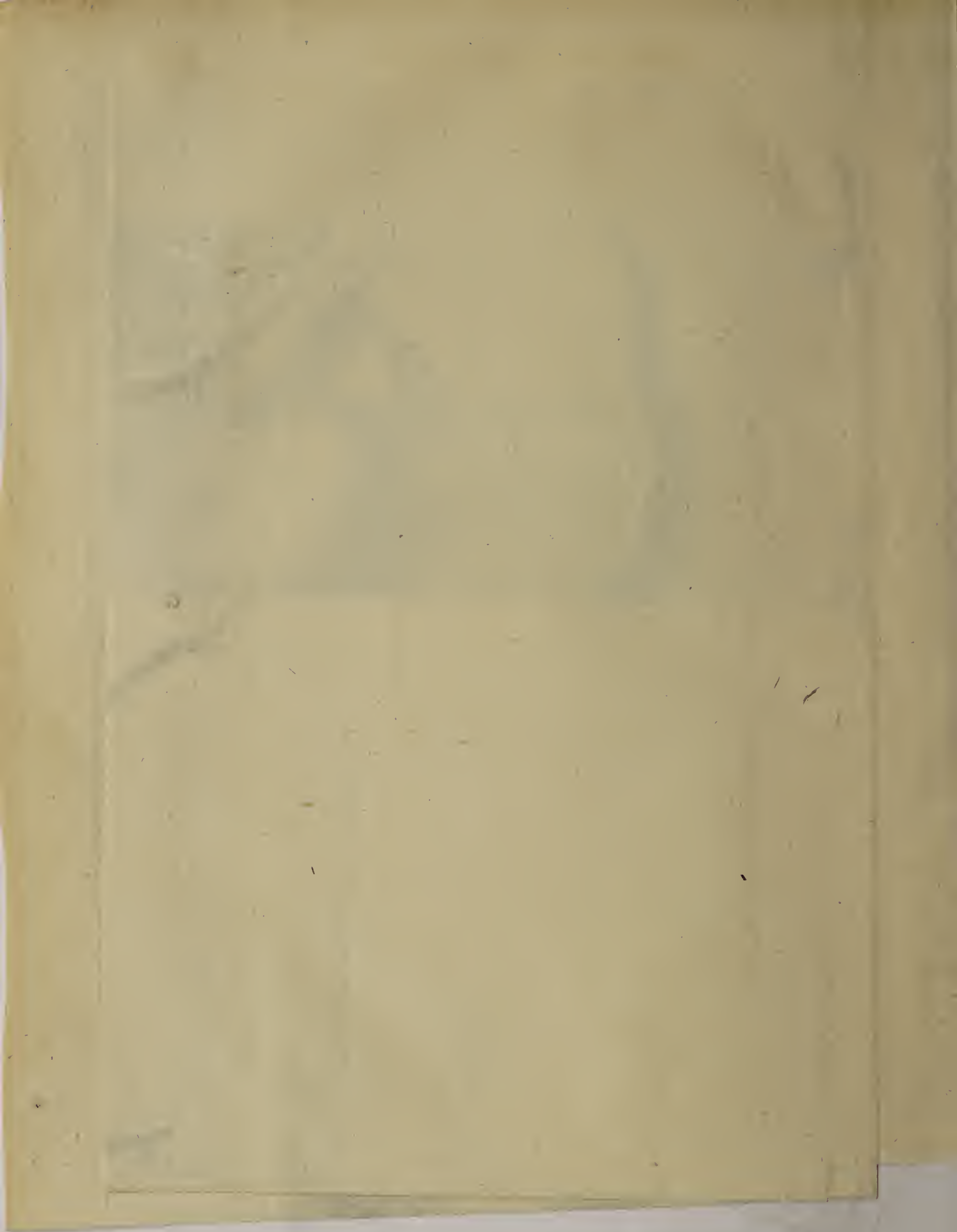




Fig. 2. *a. a. a.* The Heart opened to show the Parts of its Ventracles. *b.* The double Valve covering the Orifices of the *Ductus's* from the Auricles. *c.* The Orifice of the Right Auricle *i.* *d.* That of the Left *H.* *e.* The Orifice of the *Arteria Pulmonalis* *K.* *f.* That of the *Aorta sinistra* *L.* *g.* The Orifice common to both the *Arteria Aorta dextra* *M.* and the *Aorta superior* *N.*

Fig. 3. *a. a. a.* The Auricles. *b.* The Right Auricle. *c.* The Left Auricle. *d. d.* The Musculous *Septum* that divides the Cavities of the Auricles. *E.* The Orifice of the *Reservoir* of the Veins. *F.* The Orifice of the Pulmonary Veins. *g. g.* The large part of the Funnel. *H.* The Musculous *Ductus* of the Funnel. *i. i.* The *Reservoir* of the Veins. *K.* The Left Axillary Vein. *L.* The Right Axillary Vein. *M.* The great intestinal Vein. *N.* The great Hepatic Vein. *oo.* Two small Hepatic Veins. *P.* The Right Pulmonary Vein. *q.* The Left Pulmonary Vein.

Fig. 4. *a* The Heart of the Tortoise. *b.* The Trunk of the *Arteria Pulmonalis*. *c. c. c. c.* The Branches of the *Arteria Pulmonalis*, accompanying the *Bronchia* in the Lungs. *d. d. d. d.* The *Arteria Aorta descendens sinistra*. *e. e. e. e.* *Arteria Aorta descendens dextra*. *f. f.* One Branch of the *Aorta sinistra*, which communicates with the *Aorta dextra*. *g. g.* *Arteria intestinalis*. *h.* *Arteria Aorta superior* or *ascendens*. *i.* The Ligament that suspends the Heart. *K.* The *Trachæa Arteria*. *L. L. L. L.* The two Branches of the *Trachæa Arteria* going to the Lungs.

XVII. In cutting the Stomach or Gizzard of a Fowl, finding something resisted my Knife, upon examining it farther, I discover'd it to be a Pin, which the Pullet had swallowed, and in all probability had lain in her some time : For it had pierced thro the Membrane on the inside, and made a passage into the thick part, where it had form'd itself a Bed. It is observable that the head of the Pin had past thro the first shrivell'd Membrane, but stopt at the second, which seem'd more thick and Nervous ; so that the Head remain'd inclosed between the two Membranes, the Body of it having made its way into the fleshy Muscular part. At the point there was form'd a *Callus*, of the bigness of a small Pea, which seem'd a defence, that Nature had made to oppose it, as it was working itself farther.

A Pin in a Fowl's Gizzard by Mr. Regnart. n. 301. p. 2055.

XVIII. That the *Picus Martius* or Wood-Pecker makes a round Hole even in sound and hard Trees, such as the Oak, Horn-beam, Beech and the like, is commonly observed ; and that within these Holes, the Hollow being enlarged, the Nest is made, the Eggs laid and Hatch'd ; and the young Brood fed, as by other Birds. For this purpose, that he may be enabled to perform such hard work, the Muscles of his Neck, Breast, and Thighs, are exceeding strong in proportion to the bigness of the Bird : he has also a very firm strong sharp Bill, his Legs are strengthened with very strong Tendons ; and his

The Wood Peckers Tongue, by Richard Waller Esq ; n. 350. p. 509.



his Toes, which are two before and two behind, (as it is in some other Birds) are provided with sharp strong hooked Claws or Talons: Besides this, his Tail consists of ten very stiff large and strong Quills, firmly set into a robust strong *Uropygium* or Rump; so that when he has fastened his Claws and Feet into the Clefts and Inequalities of the Bark of the Tree, he claps his strong Tail-Feathers against the Body of the Tree; and so stands with his Head erect, to give the strokes with his Bill with the greater Force.

That he is of the Insectivorous kind is certain, and lives not only upon Insects caught creeping on the outside of Trees, but also on such as are under the Bark between the Bark and Wood, as likewise on those in rotten Wood; and as I am very confident on Worms and other Insects in the Ground: for I have frequently observed the Roots of their Bills very dirty, as it is in *Crows* and *Rooks*, &c. Whence I suppose he strikes his long sharp Bill into the soft Earth to take the Worms out of it. I have also found their Crows full of small Ants. This Bird is known to throw out a long, slender, round Tongue, to a considerable distance beyond the End of his Bill; and to draw it in again very quick into his Mouth or Bill, with the caught Insect spitted on the Tip of it.

The *Chameleon* indeed darts out its Tongue to a considerable length; and having intangled the Fly in the glutinous Matter at the End of it, draws it into its Mouth, together with the Prey; but the Mechanism in that Animal is wholly different from that of the present Subject: as may be seen by the Account the Gentlemen of the *Academy Royal* give thereof, in their *Memoirs* for a History of Animals. The Protrusion therefore of the Tongue to the length even of three or four Inches in this Bird, being very extraordinary, and the Mechanism of the several Parts for that end no less Curious; several learned Enquirers have attempted to explain it; but I am of opinion they have been, in some Particulars at least, mistaken. I shall mention some of these.

Monf. *Perault* describes it after this manner\*. This long Tongue he throws out by the means of two small bony Cartilages, about seven Inches long, and of the thickness each of a middling Pin, which are perfectly Smooth and Slippery. These two Cartilages are united at the End, and being in this place covered with Flesh make the fore-part of the Tongue. The rest of these Cartilages are separated from each other, and pass turning round under the Ears; and then rising up behind the Head, where they meet again, they pass over the Top of the Head, and so extend themselves to the Root of the Beak. These Cartilages which make the hinder part of the Tongue, are also inclosed in a Channel Fleshy on the out-side, and whose inside is covered with a very smooth slippery Membrane. Now these Fleshy Channels, which incompass and keep in these Cartilages, are the Muscles by which the Tongue is moved: for having their origine at the *Larynx*, and their insertion at the extremities of the Cartilages, it comes to pass, that when those Muscles of the two Fleshy Channels, which make the

hinder

\* *Essays de Physique*, Tom. 3. Part 2. p. 148.



hinder part of the Tongue are shortned, they force the fore-part of the Tongue out of the Beak, by drawing the posterior or farthest end nearer to the *Larynx*: and on the contrary, when the Fleshy Channel, which makes the anterior Part, acts, it draws the fore part of the Tongue into the Bill towards the *Larynx*. This Mechanilm of making a hard part, such as the bony Cartilages are, to come out and return into another, such as the Canals are, by the means of Cords drawing them, which are the Muscles, is made use of in Coaches to pull up the Glasse of the Doors; for the String being fasten'd to the lower part of the Glass-Frame, makes it rise when drawn, which resembles that Action of the Muscles by which this Tongue is moved. Of these Cartilages and other Parts, and of the Head of the Bird, Mr. *Perault* gives the Figures

Either the Wood-peckers in *France* are different from ours in *England*; or this Figure of the Head is very ill designed; it being much too broad and large, and the Beak too short. Besides he makes the 2 Cartilages to come to the Root of the Beak separately, one on one side, the other on the other side of it; whereas in all the Wood-peckers Heads I have met with, the two Cartilages joyn close together about the Top of the Head, and thence proceed joyned, though not fastned to one another, a little slanting towards the right Nose-hole, where they end together. Besides upon viewing and examining several Subjects, I could not find them agree in divers Particulars with his Account and Explication. For the Muscles which are fastned to the end of the Cartilages at the Root of the upper Beak, are not inserted at the *Larynx*, but pass on and are fastened to the lower Bill. This pair I take to be the Muscles chiefly concerned in forcing the Tongue out of the Bill. There is another pair of Muscles, which being fastned to the place where the two bony Cartilages are articulated with one single Bone in the fore part of the Tongue, (as will be shewn in the fourth Figure) is, as I apprehend, the chief pair concerned in the drawing the Tongue with its Prey into the Mouth. These proceeding from that Articulation of the Cartilages as far as the *Larynx*, (each of them sending a Branch to the *Cartilago Scutiformis*) from thence go on along with the Neck, (though not fastned to it) till they come within the Cavity of the *Thorax*, where they are inserted under the *Clavicula* or *Merry-thought bone*, as 'tis called. This pair is represented by *kk* in the second Figure; and by *qq* in the First.

Plate 15.

There is likewise a very slender white Thread, (whether Tendon or Nerve, I am uncertain) which accompanies this Muscle its whole length; and which drawn gently (for fear of breaking) pulls in with it the end of the Tongue. As there is such another all along the *Vagina* to the End at *c*.

*Volker Coiterus*, as he is mentioned by *Gerard Blasius*, \* treating of the \* *Anat. Anim.* Tongue of this Bird, makes it to be made of three slender Bones, *Cap. 24. p. 64.* round, and as he says bound together, (*invicem colligatis*) which is a Mistake;



Mistake; for though reckoning the two bony Cartilages for *Officula*, yet the third is not bound up with them, but articulated to the End of them. The same Person says the Tongue may be thrust out to the length of an Inch and a half, whereas when drawn in, it is scarce an Inch long; when in reality it may be thrown out near four Inches; and I believe cannot be drawn in, so as to be less than an Inch and a quarter, *viz.* to that place where the two Cartilages are articulated with the single Bone. Besides he makes the use of the long flat Muscle running over the Top of the Head, to be (if I rightly apprehend his meaning) to draw the Tongue to the upper Jaw, whereas their use is for thrusting the Tongue out of the Bird's Mouth. But this Person, having given no Figures, has rendred what he says less intelligible; though indeed he mentions two pair of Muscles, as there are so many chiefly concerned, yet there are at least two other Pair, that assist the Performance.

† De Mot. A-  
nim. Part 2.  
p. 24.

*Alphonfus Borellus* † makes the pair of Muscles concerned in thrusting the Tongue out, to be fastned indeed as they are to the lower Beak towards the Point; but then he makes their Insertion at the other End to be at the Extremities of the *Ossa Hyoidea*; whereas they really reach to the very End of the long Cartilages that go round the Head: These, by another Mistake, he makes to be the Retractors of the Tongue, and joins another Pair as Assistants in the same Action, which he makes to be twisted spirally about the *Trachea*. None of all which agree with the Subjects I have met with, as will be seen by the Descriptions of my Figures.

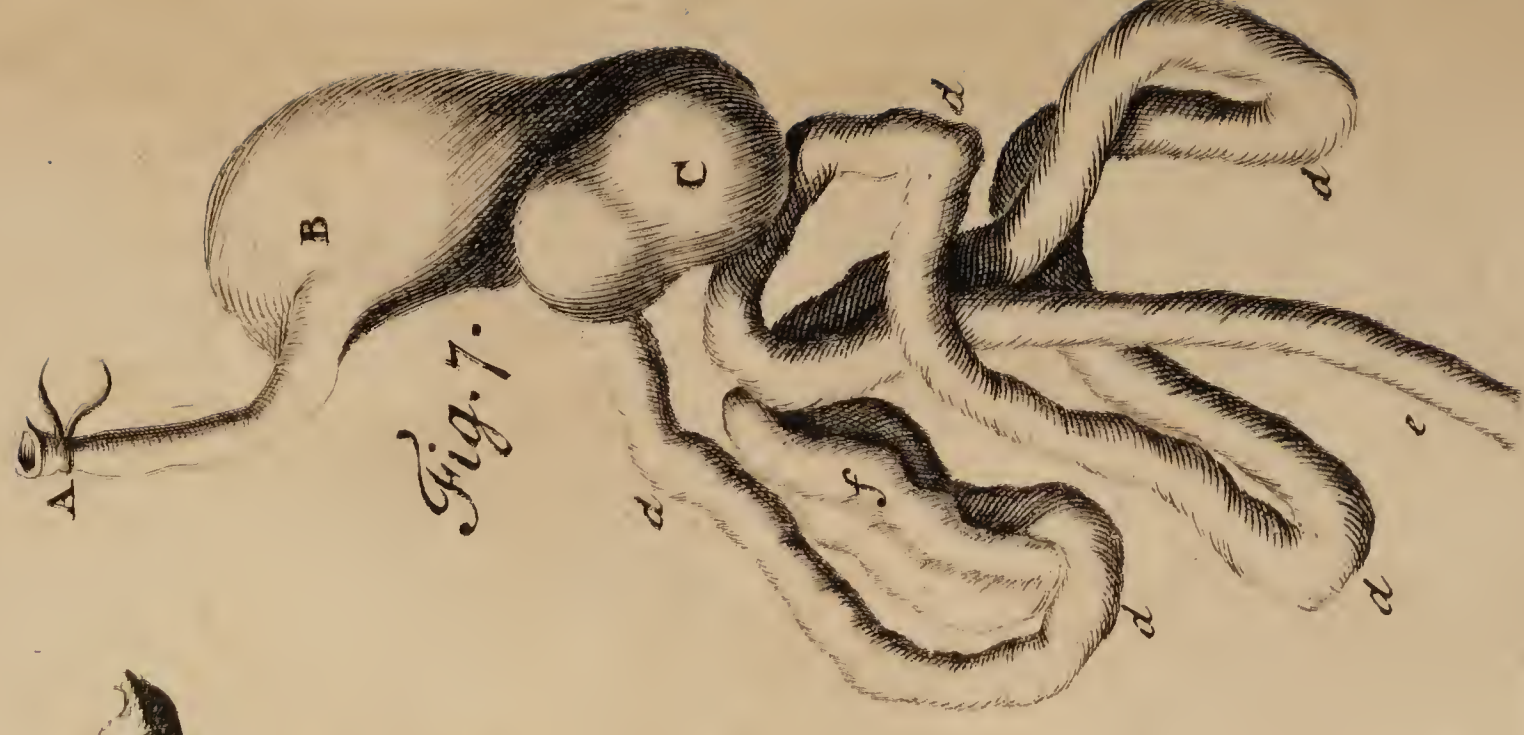
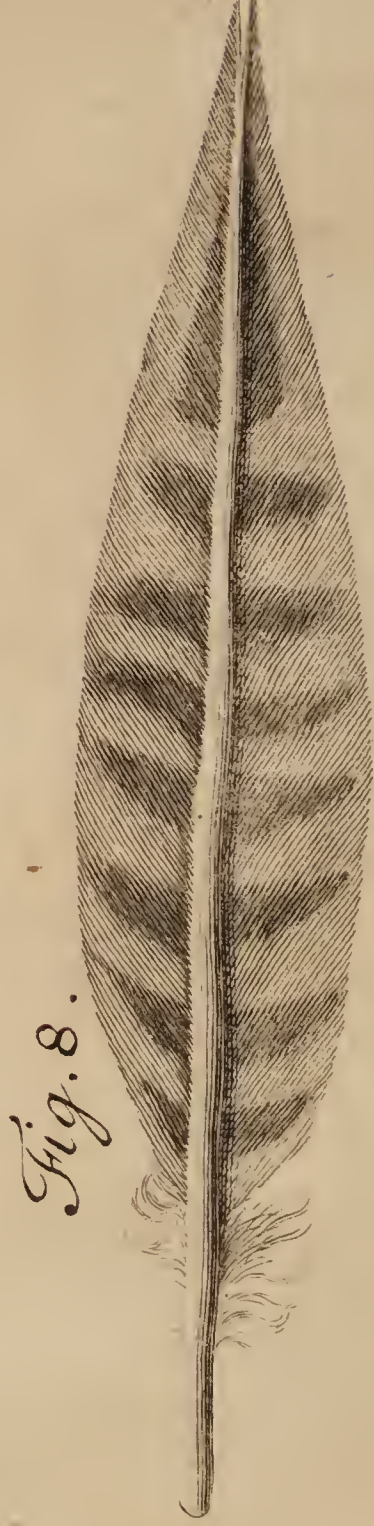
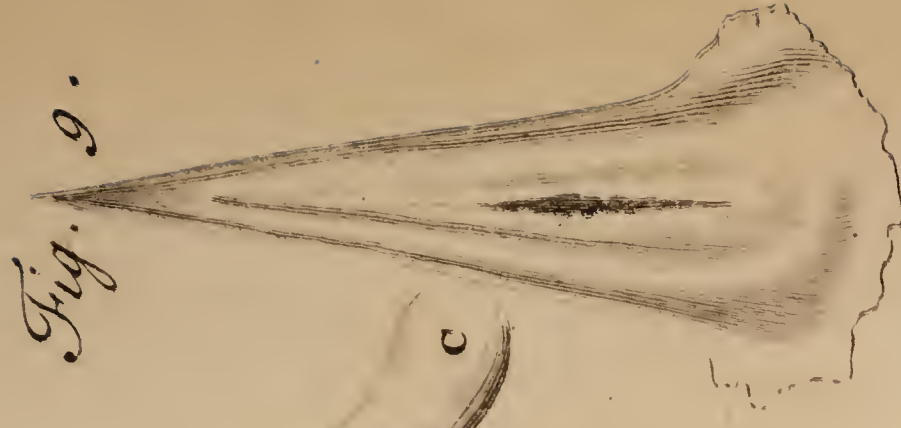
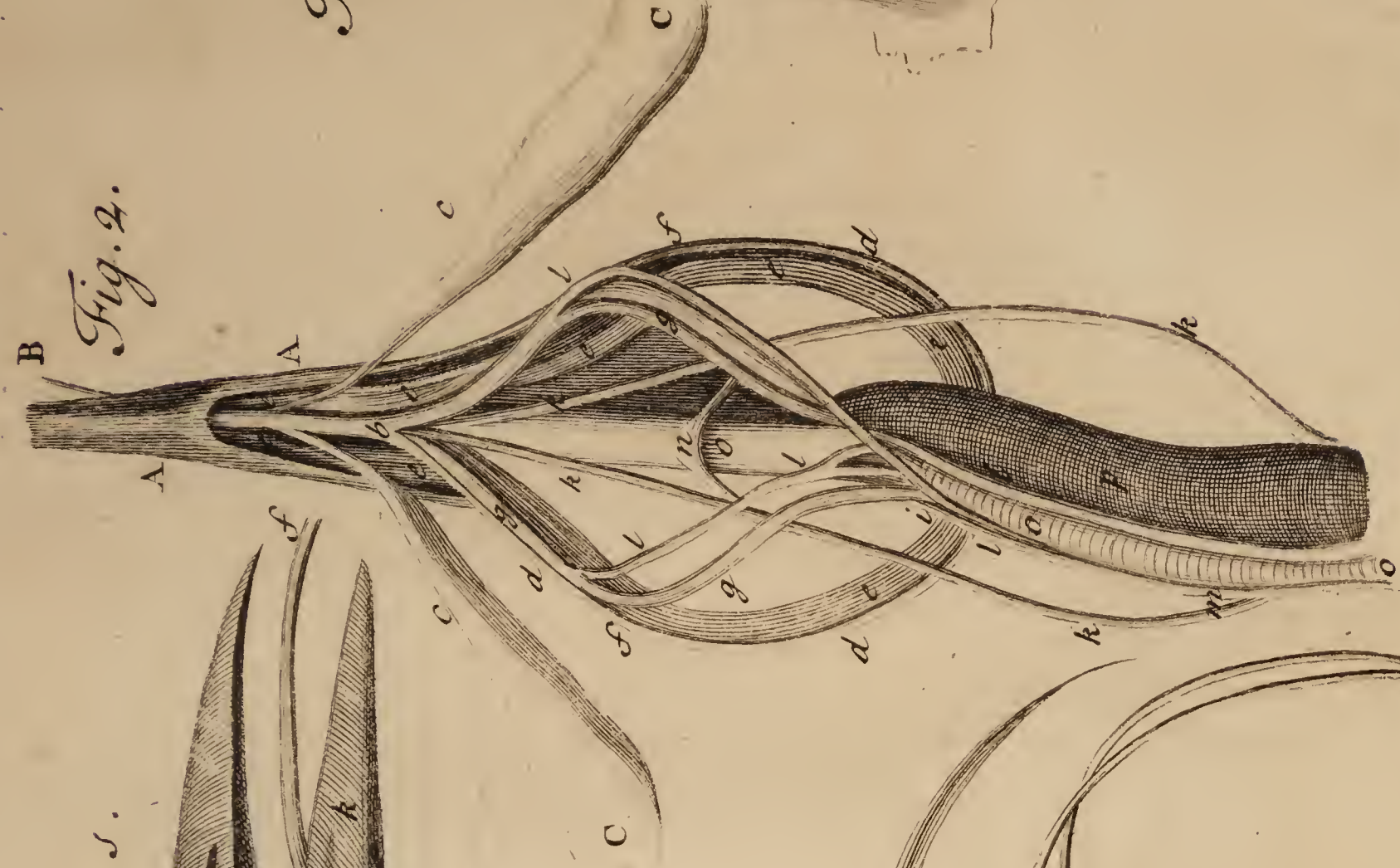
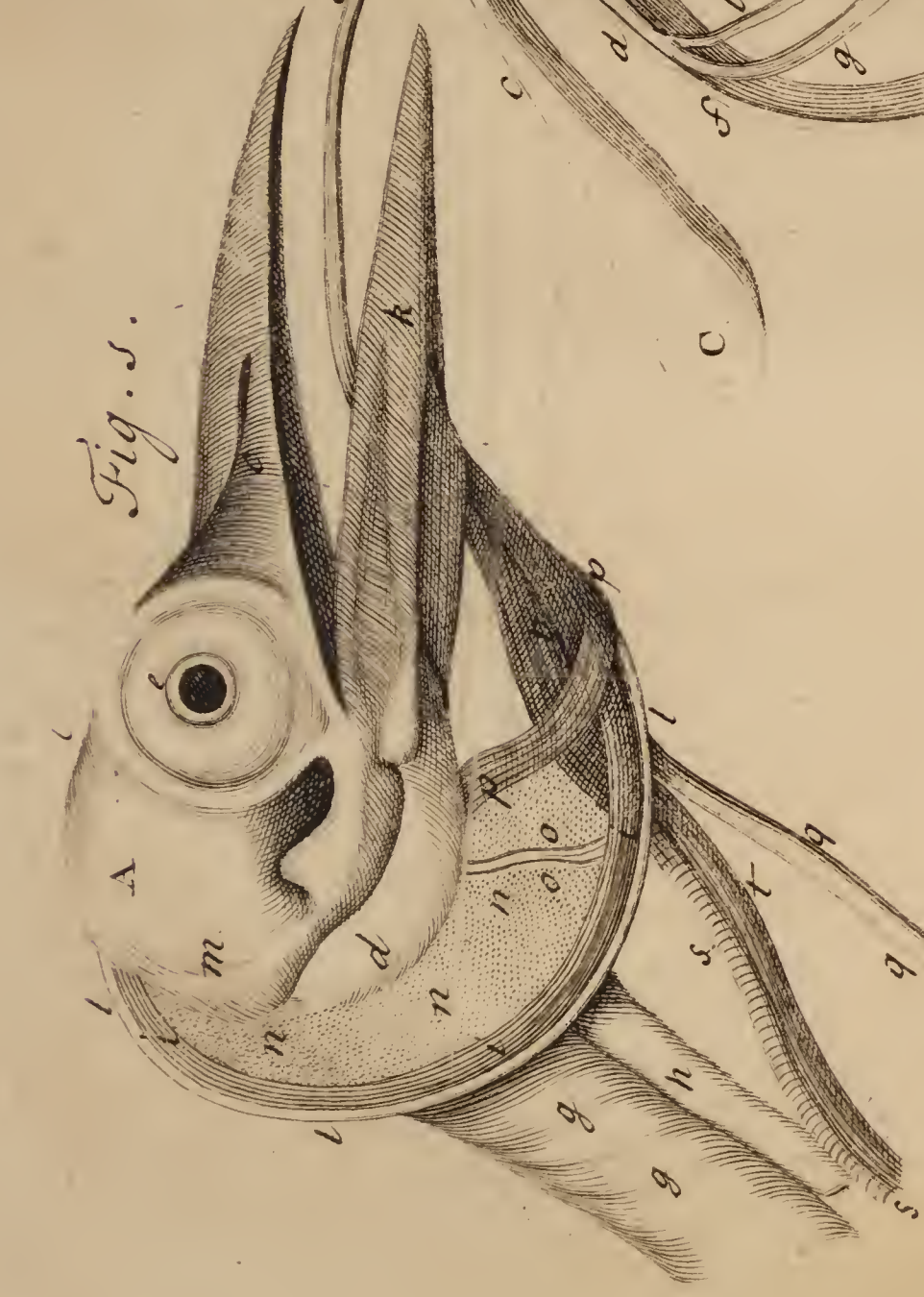
Hist. Acad.  
Roy. Sc. an.  
1698. l. 4. c. 5.

Monf. *Mery* differs from both *Perault* and *Borelli*, taking the Horny End and Bone to which it is joined, to be only the Tongue properly so called, and that the next two Bones answer the *Hyoïdes* with the long Cartilages annexed to them. But even in this he seems to me not to be so clear; confounding, as I apprehend, the two Bones with the Cartilages. He describes the *Vagina*, in which the Bones and part of the Cartilages are encompassed, and which is fastned to the Horny end, and is protruded and drawn back with the Tongue: He takes notice of the little sharp Points or Prickles on the horny Part being moveable, and with their Points bending towards the Throat; but I apprehend it is a Mistake to make the Mucous Matter Glutinous which is furnished by the two *Pyramidal Glands*; for I take the use of that *Mucus* to be chiefly, if not only, to lubricate the passage in the *Vagina*, for the more easie slipping of the Cartilages therein. He describes the Muscles for exerting the Tongue, and extends them from their Insertion at the lower Beak, to the End of the springy Ligaments, as he terms what I call *Cartilages*; to which he adds another small Ligament capable of Extension, at the end of the other two next the Nose, which, when the Tongue is thrust out, is relaxt and stretch'd. He also describes the pair of Muscles fastned to the Root of the Tongue and *Os Hyoïdes*, serving to draw the Tongue into the Mouth: These he makes











makes to be wound round about the *Aspera Arteria* once or twice, in which I think there is some Mistake; being of Opinion, the Mechanism for this Action of drawing in of the Tongue is different from what is here described, as in the Explication of the Figures I shall endeavour to shew. But not to insist on all the Particularities mentioned in this Description, which for want of more Figures to explain the several Parts in so curiously contrived an Organ, is not so clear as might be desired (there being but one, and that a wooden Cut of the Head, Tongue, Bones, Muscles, &c.) I shall now proceed to the Explication of the several Draughts I made, with what Exactness and Care I could, in 8 or 10 several Subjects.

## FIGURE the First.

Represents the Head with Part of the Neck of this Bird, the Skin being taken off, in which, Plate 15.

*A* The Skull, having two shallow Grouves or Channels, or rather one broad one with a small Rising in the midst, on the *Sinciput* or back Part, from each side of the Neck to the Top of the Head, where they unite into one, which passes slanting towards the right Side, and ends at the Hole for the Nostril on that side at *c*. *b* Is the Hole or Passage for Hearing. *d* A large white Gland, containing a glutinous Liquor almost like Cream as to Colour and Consistence, which empties itself into the Mouth; I suppose to lubricate the Cartilages. *e* The Eye, which has a bony Ring, encompassing the *Iris*. *f* Part of the Tongue, which in this Figure is represented as almost all drawn into the Mouth, of which more when I come to describe the Cartilages, &c. in the second Figure. *g* Part of the Neck, which is large and furnished with very strong Muscles. *h* The *Oesophagus*, opening very wide at the *Fauces*, and wholly Musculous. *iii* A long, but thin and flat Muscle in respect of its breadth, which is about  $\frac{1}{3}$  of an Inch, reaching from the end of the Cartilage at *c*, to the under Bill or Beak at *k*, to the inside of which it is very firmly fastned; as is such another on the other side. *k* The under Bill very strong and sharp pointed, articulated with the Skull a little behind the Ear-hole *b*. *lll* The Cartilage on one side, the other being exactly the same. This Cartilage is round, very smooth, even and slippery, about the size of a pretty large Pin; and reaches, when the Tongue is drawn in and the Muscle *ii* relaxed, from the Root of the upper Beak at *c*, to the Root of the Tongue properly so called, or to the Bones of the Tongue where they are articulated, being bent like a Hoop, as in the Figure, slipping very freely in a Sheath or Membranous *Ductus* fastned on the outward or Convex Edge of the flat Muscle *iii*, which Muscle accompanies it from its end at *c*, almost to the end of the Canal or Sheath, which opens at a Hole a little before the *Larynx*; (as will be shewn in the third Figure) and thence the Muscle proceeds to its Insertion into the lower Beak at *k*. From the Concave Edge of this Muscle, there is a

A a a

thin



thin and transparent but very strong Membrane, strained like a Drum-head to the Scull at *m*, where it is very strongly fastned; this Membrane is furnished with Capillary Veins and Arteries, and doubtless is Nervous. *nn* represents this Membrane. This Cartilage, when the Tongue is exerted, parts about half an Inch from the Root of the Beak at *c*. *oo* A pretty large Vein and Artery. *pp* A Muscle reaching from one Jaw to the other, under the Throat; serving as a Bandage to keep in the Cartilages, and the Root and *os Hyoides* of the Tongue, as I may call it, from starting out at that Part where are the Articulations of the Cartilages with the Bones, when by the Muscles, inserted into the Sheath at or near *p*, and thence passing to the end of the Tongue, it is drawn into the Mouth. *qq* One of the last mentioned Muscles, which is round, of the size in the Figure, and fastned to the Breast of the Bird, cut off at *r*. *s* The *Aspera Arteria* consisting of perfect Rings. *tt* A Muscle accompanying the *Aspera Arteria*.

## FIGURE the Second.

*AA* The under Part of the lower Bill. *Bb* The Tongue. *b* The Place where the two Cartilages and two Bones represented by *ff*, in Figure 4. are brought into and inclosed in one Tube or membranous Sheath. *CC* Two Glands displaced in this Figure. *cc* Two Muscles attending these Glands, and fastned near the end of the Bill. *dd* The two bony Cartilages, bent, and passing on each side of the Neck, but united at *b*. *eee, eee* The pair of Muscles, one attending each Cartilage, from the end of it at the upper Beak, and firmly adhering to the *Vagina*, in which it slips, till about *ff*. *ff* The place where these Muscles leave the *Vagina*, and pass on to the inside of the Bill, where they are inserted. Their Action is to thrust the Tongue forward, or out of the Mouth. *gg* A pair of Muscles fastned a little below the *Larynx*, to the musculous Part of the *Aspera Arteria*, at *i*; the other end of them going up to the place *b* at the Root of the Tongue, whence they go on encompassed by the *Vagina* to the Articulation of the Cartilages with the two Bones. I take their Action to be to draw the end of the Tongue towards the *Larynx*. *kk* Two Muscles fastned at one end within the *Thorax*, under the Merry-thought or *Clavicula*; and at the other Ends to the Articulation of the Cartilages with the two Bones of the Tongue, marked *ff*, in Fig. 4. These have the forementioned Nerves accompanying them. I take these to be chiefly concerned in drawing in the Tongue; each of these sends a Branch to the Grisle at the Top of the *Aspera Arteria* at *n*. *llll* Two Muscles running along and fastned to the Sides of the *Aspera Arteria*, from the *Thorax* to the Place where they are united, where each of them sends a Branch; which binding over the Bones and Cartilages goes on to the *Fauces*, where they are inserted. *m* Part of the *Gula*. *n* A Cartilage at the Top of the *Aspera Arteria*. *oo* The *Aspera Arteria*. *p* The Neck bending.



bending like an S. The Wind-pipe and *Gula* in this Bird pass always on the right side of the Neck.

FIGURE the Third.

*AA* The two long flat Muscles represented by *ii*, in the first Figure. These join close to one another at the Top of the Head, and so pass on together to the end of the Cartilages; to the end of which, as I take it, they are fastned: from whence a slender weak kind of Ligament reaches to, and is inserted at, the right Nose-hole, at the Root of the upper Beak. This Ligament is relaxt when the Tongue is thrust out. *bb* The Cartilages running in their *Vagina* on the outside of the said Muscles. *c* The *Larynx* or passage to the *aspra Arteria*. I observed no *Epiglottis*. *dd* Two Articulations or Joints in the under Beak or Bill. *e* The Hole or Passage, whereby the Tongue in its *Vagina* comes out and is drawn in again. *f* What I call the Tongue, in the inside of which the two Cartilages are brought together, till they are both articulated to one single Bone, at the end of which is the horny barbed Tip. *g* One of the Pyramidal Glands. *h* The lower Bill.

FIGURE the Fourth.

*A* That Part which I think may most properly be called the Tongue; a small Bone running through it: This, as far as *c*, is flat and thin at the sides. It is cut away at *d*, to shew the Bones within it. *b* The horny Tip of the Tongue, about a quarter of an Inch long, strong and sharp, furnished with four or five Barbs on each side; (not with an infinite Number, as *Coiterus* says) These Barbs are sharp and moveable, like the small Teeth at the Root of the Tongue; and beginning of the *Gula*, in the Pike and Jack-Fishes, in that of Eagles and the like; so as to let the Prey slip easily on, but not so easily get off again. *c* The end of the Bone of the Tongue where the two bony Cartilages are articulated. *d* The place where the upper part of the Tongue is cut away to shew the Bone. *e* Several small Tendons, or rather, as I take them to be, Nerves running thro' the Tongue. Of these some go to the end of the Cartilages, others accompany the Muscles to the Neck. *ff* Two Bones or Cartilages, which in the Bird, are united by a thin Membrane, as far as the next joynt, so as to open asunder to some distance, but not to separate quite. These two Bones seem to answer to the *ossa Hyoidea* in other Creatures. At the place marked *gg* the Muscle that draws the Tongue into the Mouth is fastned, or rather leaves the Tongue at that place; it having its Insertion near to the end of it: This Muscle is represented by *qq*, in the first Figure. *bb* The two bony and springy Cartilages running on each side of the Neck; which being joyned close together on the Top of the Head, pass so joyned to the Nostril, or Nose-Hole on the right side. From the Consideration and comparing of these four Figures, the true Mechanism and Motion of the Tongue, seems to be in short thus: The two long Muscles inserted near the



End of this lower Beak, and reaching to the End of the Cartilages, being contracted, the round Hoop of the Cartilages is drawn up, from each side of the Neck, close to the Pyramidal Glands; and at the same time the Muscles that draw the Tongue into the Mouth being relaxed, and the Articulations at *c* and *g g* in the fourth Figure, brought near to a straight Line, the Tongue is thrown out to the length of four or five Inches. But when those long Muscles are relaxed, the pair of Muscles represented by *k k*, in the second Figure, being contracted, draw the Articulations *g g* where they are fastned, down into the Throat or wide loose Skin of the Neck; and at the same time the Cartilages opening into a wide Hoop, the whole Tongue is drawn into the Mouth.

## FIGURE the Fifth.

*A* The Scull. *b* The shallow *Crena* or Groove, for the Cartilages. *c* The Place of their Ending at the right Nose-Hole. *d* The Orbit of the Eye. *e* The Hole for the Optic Nerve. *f* A Hole or Passage through from one Orbit to the other. *g* A Bone covering the Hole to the Ear. *h* The lower Jaw and Bill. *i* A Ridge or *Processus* in the Scull, beginning at the Root of the upper Bill, and keeping the two Ends of the bony Cartilages in their place on the right side. *k* The *Os Jugale*. *l* The upper Bill.

## FIGURE the Sixth.

Represents the right Leg and Foot in which there are two *Digiti* before, and two behind. The Strength, Largeness, and Sharpness of the hooked Claws or Talons are remarkable.

## FIGURE the Seventh.

*A* The *Oesophagus*. *B* The *Ingluvies* or Crop, partly musculous, and lined with a glandulous Coat. This I found quite filled with small black Pismires; as also *C* The *Ventriculus* or Gizzard, which joyned close to the *Ingluvies*. *d d d* The Intestines nearly of the same bigness for the whole Length. *e* The beginning of the *Rectum*. *f* The *Pancreas*.

## FIGURE the Eighth.

One of the middle pair of Feathers of the Tail, in which the great Strength of the Quill for so small a Feather, and its bifurcate End, are very remarkable.

## FIGURE the Ninth.

The Roof of the Mouth, where 'tis observable, that the *Rima* or Passage for the Air to the Nostrils, is beset on each side with a Row of 10 or 12 little sharp Teeth, with their Points standing inwards, towards the *Gula*. These take the Prey from the end of the Tongue whose Barbs or Prickles are moveable, and are to keep it from going out of the Beak again with the Tongue, and from hence it is conveyed to the Swallow.

XIX. *Nomen*. It was the famous Comical Poet *Aristophanes*, that first (*a*) makes mention of this Bird by the Name of *Χοιρινόπτερος* and  
 The Natural History and Description of the  
 (*a*) *Aristoph. Aves. Sc. 4.*



and not long after it is called *ὄρνις φοινίκεος* (b) by *Philostratus* in his *Life* of *Apollonius Tyaneus*. *Apicius*, *Plinius*, *Suetonius*, *Juvenal*, and other Latin Writers retain the Greek Word, and call it *Phœnicopterus*. *Bellonius* (c) says, that in French it is named *le Flement* or *Flambant*. *Scaliger* affirms, that in *Provence* they call it *Flammant*: And (d) *Gesner* says it may be called *Avis Rubra* per excellentiam. (e) *Aldrovandus* writes, that in *Sardinia* it goes by the Name of *Fidamingo*; and *de Laet* tells us, the *Spaniards* in the *West-Indies* call it *Flamenco*. *Dr. Charlton* and *Dr. Grew* convert the Greek Appellation into English, naming it the *Phœnicopter*: And *Sir Hans Sloane*, in his *Catalogue of Jamaica Birds* annexed to *Mr. Ray's Synopsis Avium*, styles it the *Flamingo*. (f) *Du Tertre* calls it *le Flamand*, which differs but little from the Name given it by *Bellonius*: And to mention no more, (g) *Du Hamel* says 'tis commonly call'd *Becharu* in *France*.

*Etymologia*. All these differing Names may be easily accounted for, from the Colour most prædominant in its Wings. Thus *Martial* (*Epigram* 58. *Lib.* III.) says of this Bird:

*Nomenque debet quæ rubentibus pennis.*

And again (*Epigr.* 71. *Lib.* XIII.) he makes it give the true Derivation of its own Name;

*Dat mihi penna rubens nomen.*

The Greek Name is compounded of two, viz. *φοινίκεος*, *paniceus*, *ruber*, and *πτερον*, *Ala*, a Wing, *quod sit rubentibus Alis*; which thing in different Words is express'd as follows, by the several Authors I have consulted. *Bellonius* says 'tis called in French *Flambant*, not only from the Date-Colour of its Wings, *à Dactylorum colore*, i. e. a Scarlet or light red, like the Fruit of the Palm or Date-Tree called in Greek *φοινίξ*; but also from the Lustre of the Colour resembling Flame: or as *Aldrovandus* has it, *quod velut ignis instar ejus rubedo emicet*. The Words of *Gesner* are, *Ego Gallicum nomen à rubro & flammeo rostri, crurum, pennarumque in aliquibus partibus colore inditum esse conjecerim: aut forte quoniam ex Flandria hyeme ad Narbonensis Provinciæ maritima volat; nam Flandrum Galli Flammant appellant: vel à corporis proceritate, quales solent esse Flandri*. *Mr. Willoughby* (h) says the French name it thus rather from the flammeous Colour of the Wings and Feet, than that it comes in the Winter Time from *Flanders*. For he believes there was scarce ever seen in *Flanders* a Bird of that kind; so far are they from being

(b) *Philost.* *Lib.* 8. *Pag.* 387. *Edit.* *Paris.* 1605. *fol.* (c) *Bellon.* *Histoire des Oyseaux*, *Lib.* 8. *Cap.* 8. (d) *Gesner Hist. Anim.* *Lib.* 3. (e) *Aldrov.* *Ornithol.* *Tom.* III. *Lib.* 20. *Cap.* 4. (f) *Hist. des Isles*, &c. *p.* 300. (g) *Hist. de l'Acad. Royale*, *p.* 213. (h) *Ornithologia*, *Lib.* III. *Seçt.* 2. *Cap.* 1.



common there, and flying from thence into other Countries. (k) Dr. Grew believes it named in Greek from the Scarlet Colour of its Wings; and *Flamment* in French for the same Reason. *Du Hamel* explains its Name *Becharu* by *Aratri rostrum*, (*quasi Bec-Charüe*) *quoniam rostrum ejus aratri instar inflectitur*.

*Genus*. All Authors, from *Aristophanes* down to *Aldrovandus*, have accounted the *Phœnicopterus* a Bird of the *Palmipede* or web-footed kind; and tho' this last named Author will not allow it to be so, yet he is forced to own that it is not a true *Fissipede* or digitated Fowl; *nam & membranæ digitos sepientis quoddam habet rudimentum*, are his own Words. Dr. *Charlton* only, among all the later Natural Historians, has approved of his Division, and accordingly ranked the *Phœnicopter* in the Class of *Aquatick Fissipeds*. But that it is a Water-Fowl all agree; *Aristophanes* calls it *λιμναῖος*, i. e. *palustris*; and *Aldrovandus* says of it, *Avis est aquas amans*: not to mention others.

*Differentiæ*. I find Authors are silent as to the different Sorts of this Bird, only *Aldrovandus* gives us two Figures thereof that are not alike.

*Locus Natalis*. This Bird is found in three of the Principal Parts of the World, that is, in *Africa*, *America* and *Europe*. *Heliodorus* (*Æthiop. Lib. 6.*) calls it *Νειλῶν φοινικόπτερον*, a Bird of the Nile; and the old *Scholast* upon *Juvenal* (*Sat xi. ver. 139.*) affirms, that *abundans est in Africa*; and *Du Hamel's* Words are, *Inter animantes quæ sua mole commendantur, Avis illa ex Ægypto allata est, quam Veteres ob plumas in alis rubeas Phœnicopterum dixere*. *John de Laet* writes, that there is an abundance of them in the Island of *Cuba*, as also at the Isle called *Rocca*, lying on the Coast of the Province of *Venezuela* in *South America*; and *Rochfort* says the same thing of the Island of *St. Domingo*.

(l) *Dampier* saw some few of them at *Sal*, one of the *Cape Verde* Islands: He hath likewise seen some of them at *Rio la Hacha*; also at an Island near the Main of *America* right against *Querisao*, call'd by the Privateers *Flamingo Key*, from the Multitude of these Fowls that breed there; and he never saw of their Nests and Young but there only.

Tho' these winged Creatures live for the most part in those hot Countries, yet they sometimes visit us here in *Europe*, and so may be accounted amongst the Migratory Kind, or Birds of Passage, which is confirmed by the Testimonies of several Authors: For,

*Bellonius* told us long ago, *migrant ultra mare*, and are often taken in *Italy*, and oftner in *Spain*.

(m) *Gassendus* says, they are frequently caught in the fenny Grounds and Marshes about *Arles* in *Provence*, upon the *Rhone*.

*Gesnerus*. *Quidam mihi retulit avem hanc non procul à Monte-Pessulano*

(k) *Musæum Reg. Soc.* p. 67. (l) *Damp. New Voyage round the World*, p. 67. (m) *Gass. Vita Peiresc. Lib. II. in fine.*



*capi.* He says in another Place, that they swim in Flocks not far from the Shore in *Mediterraneo Mari Gallico.*

*Willoughby* writes, that in hard Weather in the Winter Time, it comes over to the Coast of *Provence* (and is often taken about *Martiquez*, a Sea-Port Town in that Country) and in *Languedoc*, and is frequently found about *Montpelier*: But whence it comes and where it is bred, to me, says he, is unknown. N. B. This Passage is not in the Latin Edition of his Works, but added to the English which was published two Years after the first. However, he says positively, that they don't come from *Flanders*, where they are so far from being common, as some alledge, that there never was one seen in that Country.

(n) *Dr. Charleton* informs his Reader that he was presented with the Skin of one of these Birds, well stuffed and dried, by a Gentleman at his Return from the University of *Montpelier*, near which Place it had been taken. *Hujus exuvias ritè conditas infertaque mihi dono dedit prænobilis Juvenis D. Thomas Crew, Eq. Aurat.*

(o) *Dr. Lister* says, *Frequens est Phœnicopterus in paludibus maritimis ad mare Mediterraneum Provinciæ & Languedociæ.*

Whether this Bird were known by *Aristotle* is a Question; for all our Writers of Natural History agree, that the *Phœnicopterus* is nowhere mentioned by Name by the Philosopher; yet they can hardly believe that he was ignorant of a Bird so clearly described by his Contemporary *Aristophanes*. *Mirum est*, says *Gesner*, *hujus tam pulchræ & eximiae Avis nomen ab Aristotele taceri, cum Aristophanes, qui vixit eadem ætate, meminerit. Sed Græcis etiam raram esse hanc avem puto.*

*Bellonius* thinks that *Aristotle* described this Bird under the Name of *Glottis* or *Lingulaca*, as *Theodorus Gaza* translates it. *Aldrovandus* is of the same Opinion, but *Gesner* and *Scaliger* are not; for the first says, *Ego vero iis, quas Gallinulas aquaticas nostri vocant, avibus Glottidem adnumero quæ omnes fissipedes sunt.* And the latter in his Commentary upon this Passage says, *Glottis autem quæ sit nondum mihi constat. Ridiculum quod quidam de Phœnicoptero ausus est pronuntiare.*

*Victus Ratio, Nidificatio, Volatus, &c.* *Gesner* says, *Circa lacus & paludes viſitat*, and that it feeds on Perwinkles and Fish: And by *Dampier's* Account we learn, that they delight to keep together in Flocks, and feed in Mud and Ponds, or in such Places where there is much Water; that they are very shy, and therefore it is hard to shoot them; that they build their Nests in shallow Ponds, where there is much Mud, which they scrape together, making little Hillocks, like small Islands, appearing out of the Water, a Foot and an half from the Bottom: They make the Foundation of these Hillocks broad, bring-

(n) *Charlton de Differentiis & Nom. Animalium.* (o) *Listeri Annot. in Apicium Cœlium, Lib. VI. cap. 7.*



ing them up tapering to the Top, where they leave a small hollow Pit to lay their Eggs in. And when they either lay their Eggs or hatch them, they stand all the while, not on the Hillock, but over it, with their Legs on the Ground in the Water, resting themselves against the Hillock, and covering the hollow Nest upon it with their Wings: For their Legs are very long, and building thus, as they do, upon the Ground, they could neither draw their Legs conveniently into their Nests, nor sit down upon them otherwise than by resting their whole Bodies there, to the Prejudice of their Eggs or Young, were it not for this admirable Contrivance, which they have by Instinct. They never lay more than three Eggs, and seldom fewer. The young ones cannot fly till they are almost full grown; but will run prodigiously fast. Thus far *Dampier*.

*Du Tertre*, in his History of Isles, &c. gives these further Circumstances. ‘ Ces oyseaux, dit il, ont le ton de la voix si fort, qu’il n’y a personne, en les entendant, qui ne creust que ce sont des trompettes qui sonnent. Ils sont toujours en bandes, & pendant qu’ils ont la teste cachée, barbotant dans l’eau comme les Cygnes, pour trouver leur mangeaille, il y a toujours un en sentinelle tout de bout, le col étendu, l’œil circonspect, & la teste inquiète. Si tost qu’il apperçoit quelqu’un, il sonne la trompette, donne l’alarme au quartier, prend le vol tout le premier, & tous les autres le suivent. Ils volent en ordre comme les Grues; que si l’on les peut surprendre, ils sont si facile à tuer, que les moindres blessures les font demeurer sur la place. Ils sont rares & ne se voyent jamais, si non dans les salines le plus éloignées du Peuple.

‘ On les écorche, & de leur peaux on fait de fourreurs, que l’on dit estre tres utile a ceux qui sont travaillez des froideurs & debilité d’estomac.

*Rockfort* likewise informs us, That ‘ Ils ont l’Ouye & l’Odorat si subtile, qu’ils eventent de loin les chasseurs, & les armes à feu. Pour éviter aussi tout surprise, ils se posent volontiers en des lieux découverts, & au milieu de marécages, d’où ils peuvent appercevoir de loin leurs ennemis; & il y en a toujours un de la bande qui fait le guet. Ils sont gras & ont la chaire assez delicate. On conserve leur peau qui est couverte d’un mol duvet, pour être employé aux mesmes usages que celles du Cygne & du Vautour.

*De Laet* observes, that these Birds are so accustomed to Salt Water, that the *Indians*, when they tame them, mix Salt with the fresh Water for them; else they pine away and die. And though *Aristophanes* says it is ἐ τῶν ἠδαιδῶν, or not used to be tame; yet, *Gassendus* writes, that *M. Varius*, President of the Parliament at *Aix* in *Provence*, and a great Friend of *M. Peiresc*, used to divert himself with feeding them with Bread moisten’d with Water, which they commonly eat in the Night and not in the Day Time. The same learned Person observed, that they could discern the Approach of cold Weather, and would come to the Fire, so



as sometimes to burn their Feet; and that when one Foot pained them, they would go upon the other, using their Bill instead of the burnt Foot; That they slept standing upright on one Foot with the other drawn up to their Breast among their Feathers: And lastly, that very little Sleep served their Turn.

*Ufus.* This beautiful and scarce Bird was much esteemed by the Romans, and frequently made use of in their costly Sacrifices and sumptuous Entertainments. Thus *Suetonius* (q) describing the exquisite Sacrifices which were appointed by the mad Emperor *Caligula* to be offered to himself as a Divinity, says of them, ‘*Hostiæ erant Phœnicopteri, Pavones, Tetraones, Numidicæ, Meliagrides, Phasianæ, quæ generatim per singulos dies immolarentur.* And the same Historian relates further (r) that this Emperor, ‘*Pridiè quam periret, sacrificans respersus est Phœnicopteri sanguine.*

That the Tongue of this Volatile was much commended, and in great Esteem for its excellent Taste and most delicious Relish, will appear from the following Quotations. And first we read in *Pliny* (s) that *Apicius* said the Tongue of this Bird was a delicious and savory Bit, ‘*Phœnicopteri linguam præcipui esse saporis Apicius docuit, nepotum omnium altissimus gurgis.*

The Poet *Martial* says the same thing in the forecited Epigram:

*Dat mihi penna rubens nomen: sed lingua gulosis  
Nostra sapit;*

And *Juvenal* (t) in that Satyr where he exposes the extravagant Luxury and Gluttony of the Romans, mentions this Fowl among some others equally rare, that they made use of in their Feasts.

*Et Scythicæ volucres & Phœnicopterus ingens.*

We read in *Suetonius* how the Emperor *Vitellius* had them often served at his Table, with a great many more Varieties brought from the most distant Parts of the Universe; his Words are (u) ‘*In hæc Scarorum jecinora, Phasianorum cerebella, linguas Phœnicopterum, Murænarum lactes à Carpathio usque fretoque Hispaniæ per Navarchos ac Triremes petitarum commiscuit; hoc est, ab extremis imperii finibus Orientem versus & Occidentem.* And *Heliogabalus*, another of the Roman Emperors, as *Lampridius* writes, treated his Courtiers with sumptuous nice Dishes made of the Inwards and Brains of *Phœnicopters*, *exhibuit Palatinis ingentes dapes extis & cerebellis Phœnicopterorum reffer-  
tas.*

What is related by *Gassendus*, in the Life of that Learned Nobleman, *Peireskius*, is no Argument against the excellent Relish of the Tongue of this Bird. For his Friend *Varius*, who therein seems to contradict

(q) *Suetonii Caligula*, §. 22.  
cap. 43.

(t) *Juvenal. Sat. XI.*

(r) *Scalig. §. 57.*

(u) *Suetonii Vitell. §. 13.*

(s) *Plinii Nat. Hist. Lib. X*



the received Opinion, was at that time just upon the Recovery from a long Illness; he had no Appetite, loathed all Sorts of Meats, and mended but very slowly; so that its no Wonder if he did not perceive all the Relish of that nice Bit, for which of old it was so much commended. Besides this Answer is not as to the Tongue, which was owned to be much sweeter than that of a Kid, but to the Flesh of this Bird (as will appear from the Original.) ‘*Rogatus subinde fuit de sapore carnis Phœnicopteri. Excepit autem mirari se, cur illam Apicius apud Plinium, & Imperatores Caligula & Vitellius apud Suetonium, Heliogabalus apud Lampridium & nonnulli alii tantis in deliciis habuissent. Esse enim eam injucundam, aut saporis certe non exquisiti, aquaticarum aliarum instar, cum etiam piscem oleat; unde à Provincialibus ut plurimum abjicitur, exuviæque solum sunt usui in fastuosis conviviiis, carnibus aliarum avium obtegendis.*

The Way to dress the *Phœnicopter*, and how to make a Sauce fit for it, we may read in *Apicius's Book de Obsoniis & Condimentis, seu de Arte coquinariâ, Lib. VI. c. 7.*

‘*Phœnicopterum elixas, lavas, ornas; includis in cacabum, adjicias aquam, salem & aceti modicum; dimidiâ cocturâ alligas fasciculum porri & coriandri ut coquatur: Prope cocturam defrutum mittis, coloras: adjicies in mortarium piper, cuminum, coriandrum, laseris radicem, mentham, rutam: fricabis: suffundis acetum: adjicies caryotam. Jus de suo sibi perfundis, reexinanes in eundem cacabum, amilo obligas, Jus perfundis & inferes. Aliter. Affas avem, teres piper, ligusticum, apii semen, sesamum, defrutum, petroselinum, mentham, cepam siccam, caryotam; melle, vino, liquamine, aceto, oleo & defruto temperabis.*

*Philostratus.* ‘*Puniceam avem, i. e. Phœnicopterum, inter mensarum delicias numerat, Lib. VIII. Vitæ Apoll.*

*Musæum.*

*Wormius.* ‘*Linguam hujus avis veteribus Romanis in deliciis olim fuisse docent cupediæ magistri Apicius & alii.*

*Dr. Grew.* The Tongue of this Bird, as *Apicius* said, was a delicious Morsel among the Romans.

*N. B.* In the Treatise *de Obsoniis & Condimentis*, that goes under the Name of *Apicius*, there's no mention made of the Tongue of this Fowl: For as *Dr. Lister* well observes, ‘*Apicius noster hîc silet de linguæ præcipuo sapore: Which is a pretty convincing Proof, that this Book de re coquinaria, is only a Collection made by some modern Roman; the Name of the old Apicius, that great Master of the Art of Eating, being only prefixed to it, for the Benefit of the Bookseller.*

*Dampier.* The Flesh of both young and old is lean and black, yet very good Meat, tasting neither fishy nor unsavory: A Dish of *Flemingo's* Tongues being fit for a Prince's Table. They are large, having a large Knob of Fat at the Root, which is an excellent Bit.



*Du Tertre.* ' La chair en est excellente, quoy qu'elle sent un peu la marine : mais sur tout la langue passe pour le plus friand morceau qui puisse estre mangé.

*Descriptio Partium.*

*Magnitudo.* According to *Bellonius* this Bird is of the Bigness of the Fowl he calls *Elorius*, which is our *Curlew*.

*Scaliger* compares it to the Heron, *magnitudo ei Ardeæ.*

*Gesner* says it is as big as a *Ciconia* or Stork, or rather bigger.

*Aldrovandus* writes, ' de magnitudine ejus ego nihil certi assero, quia avem nunquam vidi.

*Dampier.* The *Flamingo* is a sort of large Fowl much like the Heron in Shape, but bigger and of a reddish Colour.

*Du Tertre.* ' Le Flamand est un oiseau gros comme une Oye sauvage.

*Collum.* It hath an extraordinary long Neck according to Mr. *Willoughby*.

*Du Tertre.* ' Il a le cou rouge, fort menu pour la grandeur de l'oiseau, & long d'une demy Toise.

*Cauda.* *Scaliger.* ' Caudam habet brevissimam ac veluti præcisam.

*Rostrum & Caput.* *Scaliger* writes, that the Bill of this Fowl is neither streight nor altogether crooked : ' Rostrum neque rectum planè sed neque aduncum habet, Scythici arcus partem potius imitatur.

*Gesner*, who compares this Bird to the Crane for Bigness, adds, ' Rostro sesquialtera fere longitudine ad *Ciconiæ* rostrum, superius crasso & tuberculis quibusdam aspero.

*Aldrovandus* commends the Account *Scaliger* gives of the Bill, and then adds, ' In Rostris autem conformatione non parum lussit Natura ; non enim, ut Anatùm aut Anserùm, planum est, cum alioqui sit latum, neque ut Ardearum rectum & rotundum, neque denique ut rapacium Aquilarum aut Accipitrum aduncum ; cum tamen sit curvum quidem & deorsum inflexum, sed in medio superioris mandibulæ notabili extuberantia insigne, sex digitos longum, intus cavum & canaliculatum media sui parte. Superior etiam mandibula inferiori longior est, & in acutissimam aciem desinit ; contra vero inferior longè crassior.

*Du Tertre.* ' Il a la teste ronde & petite, à laquelle est attaché un gros bec, long de quatre pouces, moitié rouge & moitié noire, & recourbé en forme de cüeilliere.

*Olaus Wormius* gives the following Description of the Head and Bill of the *Phœnicopter*, which he had sent him from a Friend, *viz.*

' Caput longitudine uncias octo superabat, ipsum caput, excepto rostro, trium erat. Rostrum ipsum figuram à *Scaligero* delineatam obtinet in medio crassum satis sed cavum, superiore ejus parte utrinque ad latera canaliculatum ; ad sui exortum duobus grandibus foraminibus olfactui deputatis præditum, in extremitate aduncum, internè denticulatum cum costâ seu eminentiâ in medio. Pars vero infe-



rior nigra, frequentibus prædita striis ad extremum excurrentibus ;  
longitudine vero cedit superiori, sed ampla est & capax, crassæ lin-  
guæ quæ aberat, excipiendæ apta.

Dr. Grew has obliged us with a very curious Account of the Bill of this Bird, for which he says it is most remarkable. The Figure of each Beak is truly Hyperbolical: The upper Jaw is ridged behind, before plain or flat, and pointed like a Sword, with the Extremity bended a little downwards: Within it hath an Angle or sharp Ridge, which runs all along the Middle, at the Top of the Hyperbole, not above a quarter of an Inch high: The lower Beak in the same Place above one Inch high, hollow, and the Margins strangely expanded inward, for the breadth of above a quarter of an Inch, and somewhat convexly. They are both furnished with black Teeth, as I call them from their Use, of an unusual Figure, *scil.* slender, numerous, and parallel as in Ivory Combs; but also very short, scarce the eighth Part of an Inch deep. An admirable Invention of Nature, by the Help of which and of the sharp Ridge abovementioned, this Bird holds his slippery Prey the faster.

Mr. Ray describes the *Rostrum* to be *latiusculum, singularis & insolitæ figuræ*; *mandibula nempe superior incurva, depressa, dentata*; *inferior crassior.*

*Menippus*, the Cynick Philosopher, in a Fragment of his *de Homine* (which however at this Time is either lost, or at least hard to be come at) affirms this Bird to move its upper Jaw, as we find him quoted by (y) *Rondeletius*, where he is talking of the Crocodile's moving that Mandible: His Words are, *Sed id non soli ex omnibus animalibus Crocodilo peculiare, nam inter aves, Phœnicopterus superiorem partem Rostri movet, ut annotavit Menippus Philosophus, Libro de Homine.*

*Gesner* makes the very same Quotation from *Rondeletius*.

(z) *Cardanus* repeats the same thing without mention of any Author, *Nam quidam existimant etiam Phœnicopteros aves Mandibulam movere superiorem*; but subjoins, *sed non adeo manifesta causa est in Avenit in Crocodilo.*

*Wormius* is of the same Opinion; but with *Cardan*, he thinks the Cause is not so manifest as in the Crocodile.

Dr. *Charlton* says, that it was *Cardanus* that first made that Observation.

Dr. *Grew* argues for this Movement from the peculiar Structure of the *Rostrum*; alledging, however, that there can be no Determination of these Matters, without Inspection into the Muscles, and the Articulation of the Bones. As for the *Phœnicopter*, says he, it must needs be said, that the Shape and Bigness of the upper Beak (which here, contrary to what it is in all other Birds that I have seen, is thinner and

(y) *Rondel. Lib. de Amphibiis, Chap. 5.*

(z) *Cardan. de Varietate Rerum, Lib. 7. Cap. 37.*



far less than the neither) speaks it to be the more fit for Motion, or to make the Appulse, and the neither to receive it.

*Crura & Pedes.* Bellonius remarks, that the Legs of this Volatile are very long. And on the contrary,

\* Scaliger writes, *Crura pedesque sunt adeo breves, ut cum in Homine Galenus agnoverit longissimos, huic omnium, quæ nota sunt nobis, animalium brevissimos attribuere potuerit.* For this he is severely taxed by Dr. Charlton, *hic nobis candidè notandus occurrit error quidam Scaligeri egregius: Is nimirum in Exercit. in Arist. Hist. Animal.* (this is wrong quoted, the Place being in *Arist. Lib. de Generat. Anim.*) *peculiares Phœnicopteri notas satis prolixè describens, crura ei brevissima curtosque pedes attribuit, (verbis supra citatis) atque Avem hanc & cruribus & suris gradiri longissimis, omnium quorumque seu vivam seu mortuam contemplati sunt oculi confirmant. Et quis precor, ullam aliam, ex Aquaticarum fissipedum & piscivorarum classe, volucrem unquam conspexit brevibus pedibus instructam? Certè nemo. Neque consentaneum est, ut quas Naturæ consilium ad pisces in stagnis & fluviorum vadis, non natando sed grillatoriis veluti gradibus vadando, captandos destinaverit, eis crura concederentur tam necessario ad victum quærendum officio imparia. Ad hæc, non aliunde fuit quàm à proceritate crurum & colli, quod Phœnicopterus olim à Juvenale ingens diceretur.*

Dr. Grew observes the same Mistake, but in fewer Words, which are the following; *when Scaliger therefore saith that this Bird hath the shortest Legs of any Animal yet known, he would have said the longest.*

Gesner says, it is *Cruribus rubris, ea proceritate qua in Ciconia sunt, vel procerioribus.*

‘ Du Tertre. C’est le plus haut monté de tous les oyseaux que j’ay jamais veu en ma vie. Il a les jambs tout rouges, & les pieds à demi marin.

‘ (y) Rochfort. Ils ont les jambs & les cuisses si hautes, que le reste de leur corps est élevé de terre de deux bons pieds ou environ.

*Color plumarum.* Scaliger thus elegantly expresses the fine Colour of its Wings. *Cinereum colorem nobilitant alarum puniceæ pennæ.*

Aldrovandus. *Mirum est cur nigrum alarum colorem non annotavit Scaliger. Cætera tota Avis ex cinereo, phæniceo & albo coloribus mistis spectatur.*

Gesner says, *Pennis albis parte prona; rubentibus per Collum, Pectus, Ventrem & Alas;* and speaking of one taken near Montpellier, he says, *tota alba, præter illas in alis partes quæ nigrae sunt in Ciconiæ.*

(z) De Laet observes, that while they are young their Feathers are chiefly white; but as they grow up, they are painted with an Infinity of Colours. ‘ *Mais ils different en couleur, d’autant qu’ils ont le plumage blanc quand ils sont jeunes; puis apres à mesure qu’ils*

‘ *croissent,*

\* Scalig. *Exercit.* 233. § 2. de Subtilitate, ad Cardanum. (y) *Hist. des Antilles, Edit. Rotterdam.* p. 583. (z) *Hist. du Nouveau Monde, Lib. 1. Cap. 9. & Lib. 18. Cap. 15*



croissent, ils devient de couleur de rose, & en fin quand ils sont  
 agez, il est tout incarnat. Il se trouve de ce mêmes oiseaux, pres  
 de Montpelier, qui ont seulement le dessous des ailes & du corps incar-  
 nat, & le dessus noir. Ils s'en voit aussi aux îles, qui ont les ailes  
 mêlées de quelques plumes blanches & noires.

*Du Tertre* gives much the same account. Les Jeunes sont beaucoup  
 plus blancs que les vieux, & ils rougissent à mesure qu'ils avancent  
 en age. J'en ay veu aussi quelques uns qui avoient les ailes mêlées  
 de plumes rouges, noires & blanches, & je croy que ce sont les  
 mâles.

(†) Constantinus. *Rostrum, & crura, & pars alarum, punicio colore  
 rutilat.*

*Willoughby* says, the Neck and Body is white: The *Alarum Remiges*, or  
 Quill-Feathers of the Wings, are black; but the *Vestitrices* or Co-  
 vert-Feathers are wholly dyed with a most beautiful, bright purple,  
 or flame-Colour, *unde ei nomen.*

*Dampier*. The young ones at first are of a light grey; and as their  
 Wing-Feathers spring out, they grow darker, and never come to their  
 right Colour, or any beautiful Shape, under ten or eleven Months  
 old. When many of them are standing together by a Pond's Side,  
 being half a Mile distant from a Man, they appear to him like a Brick  
 Wall; their Feathers being of the Colour of a new red Brick: And  
 they commonly stand upright and single, one by one exactly in a Row,  
 except when feeding, and close by each other.

*Color Pedum*. All Authors agree in the red Colour of its Legs and  
 Feet. Thus *Scaliger*, *Crura pedesque alis habet concolores.*

*Color Rostris*. *Gesner* says, *Colore rubro instar sanguinis.*

*Aldrovandus* writes, *Pars quæ spectat frontem ex albo ad Castaneæ colorem  
 vergit, cæterò nigrum.*

*Willoughby* affirms, that the Tip of the Bill is black, or of a dark  
 blue.

*Figuræ*. The whole Fowl is delineated by *Gesner* and *Aldrovandus*:  
 and *Dr. Grew* has given us the Figure of the Head and Bill, as he found  
 it amongst the Rarities in *Gresham-Colledge*. N. B. The Figure of the  
*Phœnicopter* in *Willoughby* is copyed from the second of *Aldrovandus*.  
*Gesner* says the *Phœnicopterus* whence his Figure was taken, was sent to  
 him by *Rondeletius*. *Aldrovandus* had the first of his Figures from *Sar-  
 dinia*; and the second, which he calls *Phœnicopterus alter rostro lato*, was  
 given him by that famous Botanist *Carolus Clusius*: He owns that he  
 never saw the Bird himself.

In *de Rochfort*, the Body and Neck of the *Flammant* is pretty well  
 delineated; but the Legs are not, neither is the Bill, nor the Claws.

(†) Constant. *Lexicon Græco-Latin.*

(\*) *Du Hamel*



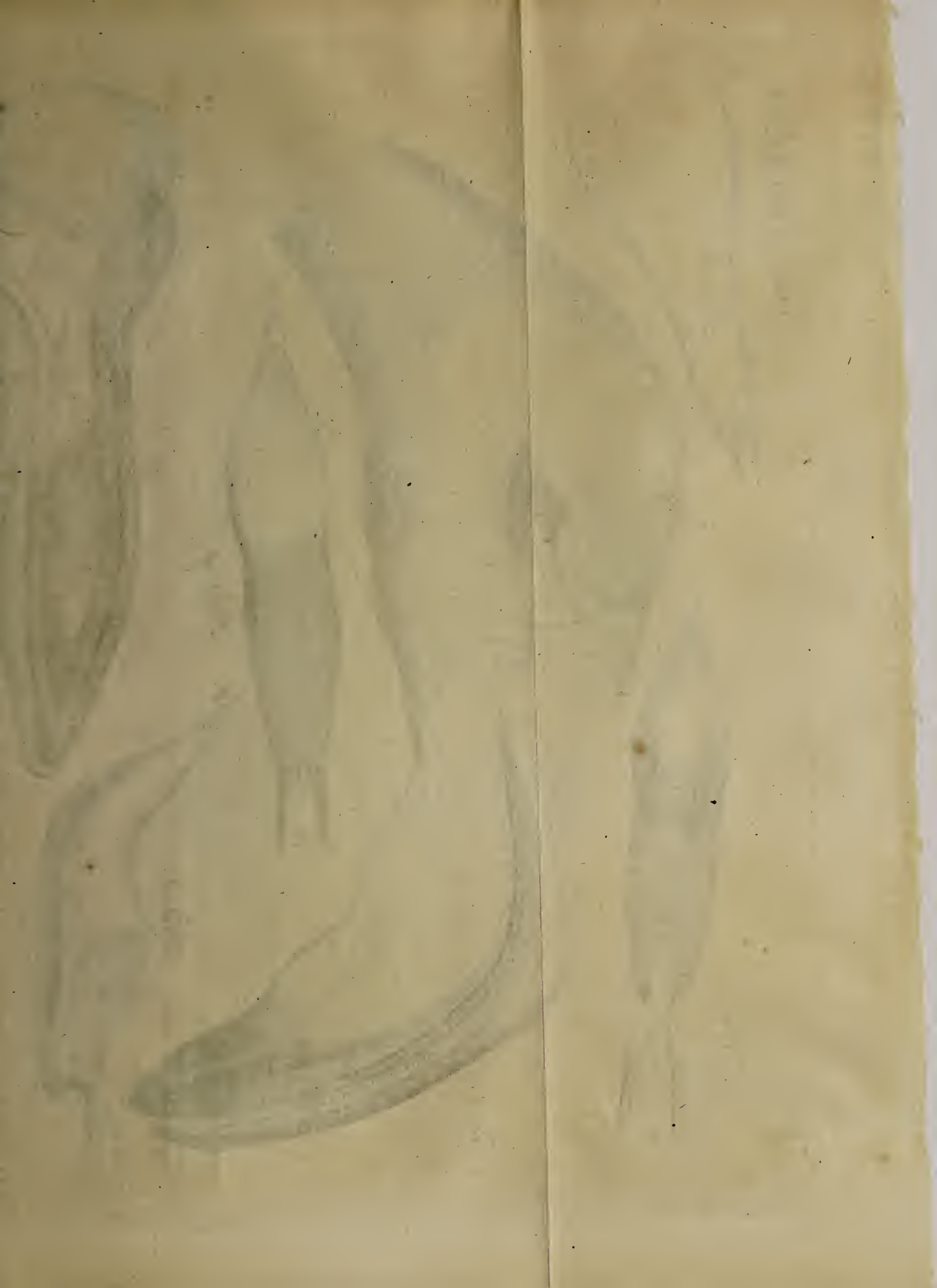




Fig. 3.



Fig. 6.



Fig. 1.



Fig. 4.

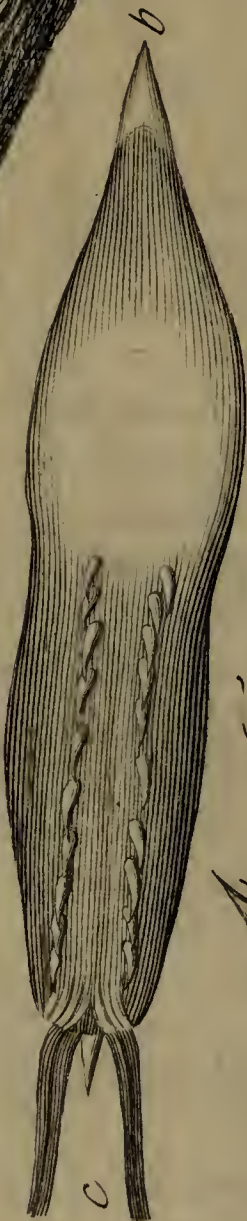
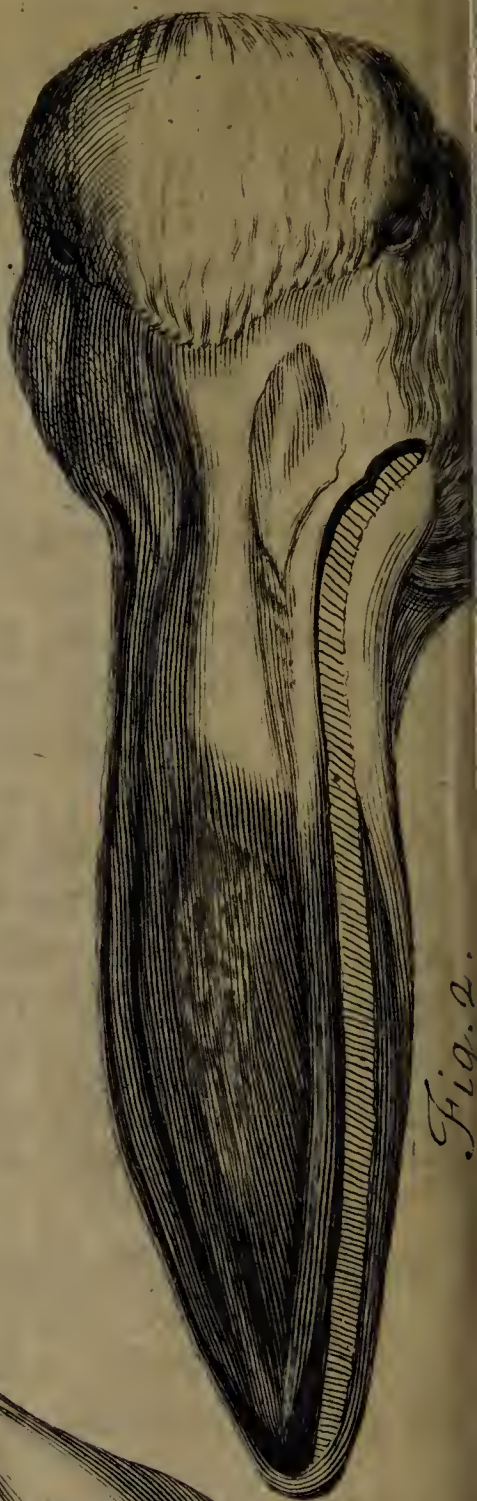


Fig. 5.



Fig. 2.





(\*) *Du Hamel* gives a very exact Account of this Bird in the following Words, with which I'll close this tedious and prolix Description, collected from all the Authors that have made any mention of the Phœnicopter or Red-Wing. *Collo prælongo; cruribus productis, exili pede sed firmo donatur; oculi itidem angusti sunt & rubei; cystis fellea è parte inferiore hepatis est pensilis. Vas ipsum è quo suspenditur, quæve bilem excipit, amplum est, contra atque in Homine & in Quadrupedibus observatur; in his enim radices vesiculæ sunt admodum exiles. Oesophagus in sui initio valde angustus, paulatim latior factus in ingluviem seu in saccum ampliorem desinit: Ventriculus fere ut in Gallina, tametsi Grana non vescitur, sed parvis Conchyliis, quæ ventriculi musculis teruntur ut Grana.* This Author tells us that the Phœnicopter was dissected by Monsieur Perault at Paris.

*Alæ ejus diductæ colorem illum rutilum exhibent, unde vulgo Flamand dici solet, non quod in Belgio reperiatur, sed quia ejus Plumæ per membranam pellucidam visæ colorem flammæ præbent: Vix ulla est Avis major: Rostrum ex utraq; parte deorsum incurvatum, quod in ea Ave omnino est singulare; aratri enim instar inflectitur, unde & vulgo Becharii, quasi Aratrirostrum, appellatur. Hæc ille.*

Fig. I. Gives a Side-view of the Head and Bill. The Explanation of the Figures. Plate 16.  
Fig. II. In this is represented a Front-view of the same Parts.  
Fig. III. Exhibits the under-side of the Tongue next the under Bill. In which *a* denotes a Cartilaginous Substance that covers the Tip or extremity of the Tongue; *b* a Glandulous Substance at its Basis; *c* the Horns of the Os Hyoides.

Fig. IV. In this the upper side of the Tongue is fairly delineated, upon which we see two Rows of strong Papillæ Nervæ; their Apices or Points turning inwards, for the better retention of the Prey.

Fig. V. In this the Tongue is drawn in a lateral View, that we may have a Prospect of the true Figure of these Papillæ, which being hooked and turn'd backwards prevent, in a great Measure, the return of any little Animal swallow'd alive, which they feed upon.

Fig. VI. The Cornua or Horns of the Os Hyoidæum are drawn in this last Figure, as all the other Parts are, as big as the Life.

XX. The Rattle-Snake seems to take its Name, from the Rattles in its Tail, in which are sometimes twenty of those loose Rings. The more Northerly they travel, these Snakes are less numerous, as well as less Venomous; nor as it is said, are any seen to the North of Merrimack River, which is about 40 miles North of Boston. It is constantly affirmed, by the Indians, that these Snakes frequently lie coiled at the Bottom of a great Tree, with their Eyes fixed on some Squirrel above in the Tree; which tho' seeming by his cries and leaping about, to be in a Fright, yet at last runs down the Tree, and into the Jaws of the Devourer. The Winter-aboad of these Snakes is in the Clefts of inaccessible Rocks, from whence in the Spring, they come forth a Sunning themselves, at first very feeble, which is their chief time of destroying



destroying them. At this time the *Cysts* or Gall-bladder in these Snakes is full of an acid azure Coloured Juice, which they squeeze out into a Glass, but it is so Spirituous, that if the Glass be not immediately stoppt, it will soon evaporate; this Liquor therefore they mix with a convenient quantity of powder'd Chalk or *Indian Meal*, and use it as a proper Medicine against the venomous Bite of this Snake; some have named it *Trochisci Connecticutiani*, from the *Connecticot Colony*. 'Tis observable when the Summer Heats come on, the Snakes have no longer this azure Liquor in their Gall-Bladders, in which there is only found a black thick Sediment, of no known use, at which time they think the fore-mentioned spirituous Juice is carried to, and lodged in their Gums, and so conveyed or thrown by the hollow of the Teeth into the Wound, when they bite, having received another Digestion, and higher Exaltation, by passing through several Strainers and Glands before it arrives to the Gums.

As an Instance of the Virulence of the Liquor, a Traveller killing one of these Snakes suffered the enraged dying Viper to bite the end of the Switch, with the Lashes of which he had disabled him; and a Fly by chance disturbing one of his Temples as he rode on afterwards, he rub'd his Temple with the other end of the Switch, which immediately caused his whole Head to swell to a great Excess, the Poison as he supposes permeating the whole length of the Switch. Another provoking a Rattle-Snake to bite the Edge of a broad Axe he had in his Hand; the Colour of the Steele'd part bitten, was immediately changed, and at the first Stroke he made with it in using his Ax, the so discoloured Part broke out, leaving a Gap in his Ax. But to return to the *Trochies* made of the Gall, it is a Cordial Sudorifick, and so good an Anodine, that some take three or four Grains of it to compose them to Rest after Travel. 'Tis good in all Fevers, especially the Malignant. 'Tis an infallible Remedy for Obstructions incident to Women upon catching Cold in Child-bed. Being taken in a convenient Quantity, twelve Hours before the Fit, it certainly cures a Quartan Ague. The Dose is fourteen Grains more or less according to the Circumstances of the Patient in any Vehicle.

*Account of  
some Fishes and  
Birds at North  
Bierly, by Dr.  
Richardson,  
n. 337. p. 168.*

XXI. About six Years ago, great Quantities of Tench were taken in a Pond belonging to *Stephen Tempest* of *Broughton* in *Craven*, Esq; and were sent to the neighbouring Markets. The Fish were taken on Monday towards Night, and some brought to *Bradford* on Tuesday about the same time; and not being frequent in our Markets, six of them were sent hither by *Mr. Ferrand* the Vicar on Wednesday. I not being at home, the Basket was set upon the Kitchen Table, not far from a good Fire; where it continued till Thursday Morning (the Servants not knowing what was in it.) Upon opening the Basket, and looking upon the Fish, I thought the Eyes of some of them look'd clear: I put two of them into a Pail of Water, and in less than two Hours time



time they swam very lively in the Water. The remaining 4 having no Signs of Life upon them, I put them into the same Pail, and before Night they all swam about in it. *Burbolts*, being a Fish not frequently met with in the Southern Rivers of *England*, are often found in this County, especially in slow Rivers and standing Waters, as in the River *Foss* in *York*, and also in *Derwent*; but in no Place more frequent, than in the Fen Ditches of the Levels, about four Miles from *Doncaster*. I have been several times present, when plenty of small Trouts have been caught in the mountainous Lakes of *North Wales* by Angling; and have, with no small Admiration, consider'd the difficult Access to these Places, where a good Footman can scarce climb up to them. That these Lakes are yearly supplied from the Brooks at the Bottom of the Mountains I do not at all doubt, especially in Spawning time, when the Trouts endeavour to surmount all Difficulties, by passing up the small Rivulets, to deposite their Spawn, for the Preservation of their Species, where it is the most secure from the Violence of other Fishes, and there by accident fall into these Natural Ponds, where they continue all Summer; no Person having yet observed (that I know of) Trouts to breed in Ponds. Not only the Trouts that are taken in these mountainous Lakes are small, but also the Charrs that are taken as they ascend the small River out of the great Lakes nigh *Llhan Berys*, to deposit their Spawn in the Sands there. These very rarely exceed a fresh Herring in Magnitude, and are in no respect different from those taken in *Winander-Mear*, save in Magnitude, where 'tis no rare thing to meet with them of two pound Weight and upwards. This Smallness in Fishes I have sometimes thought to proceed from the Coldness of the Water, these Lakes being supplied with Snow Water from the Mountains eight Months in twelve. The *minera* of Vitriol and Allum being often met with in the Hills thro' which some of the Water must drain, perhaps does not a little contribute to the Roughness and Coldness of the Water. The contrary we find in our Waters that run through the Limestone Rocks, where no rough Salts are found; the Trouts there are large and fat. An Instance of this we find in the Trouts in *Malham Tarr* in *Craven*, nigh *Settle*, where they are frequently found two Foot long.

I must also take Leave to correct one Mistake of Mr. Ray, where he says \* that *Mustela vulgaris* is called here a *Foumart* or *Fitchet*. *Putorius* \* *Synops. Quad-*  
is called here a *Foumart*, *quasi* foul Mart, or stinking Mart, in Oppo- *drup. p. 195.*  
sition to the Martes which emit a musky Smell, and are often met with in our Woods, and taken by the Hunters in Snow.

The *Ermin* is not unfrequently met with here in Winter, and look'd upon, when they appear, to presage Snow. I should not here have taken notice of it, it being also met with in most Counties of *England*, but that I have had the Opportunity in two or three Instances, of observing the Time of its Changes. It begins to change its Colour from Brown to White about the beginning of *November*. I had one



of them brought me about *November* was two Years, when I first observed this Change. I have one or two of them, that in the beginning of *March* were changing from White to Brown. *Qu.* Whether these Animals do not always continue White in the more Northern Parts of the World?

The *Nut hatch* or *Nut-jobber* is not frequently to be met with in the South, yet is so common with us, that I have sometimes seen six or seven of them in one Day in my own Woods. This must be the Bird that Dr. Plot in his *Nat. Hist. of Oxfordshire*, calls a *Wood-Cracker*, and takes to be an undescribed Bird. I have with much Pleasure often observed these Birds to crack Nuts, which they do with very great Dexterity. I ordered one of my Servants, that was with me in a Wood last *Christmas*, to observe from whence she fetched her Provision; which he soon discover'd in a hollow Tree, and cutting the Place open, brought from thence several Pints of very choice Nuts. I met with a Nest of the *Regulus Cristatus*, in a thick Thorn Hedge, in my own Orchard, which was built round, and a little Hole at the side; the outside was green Moss, the inside Hair and Feathers, not much unlike that of the common Wren. The Eggs were small and white, with many brown Spots upon them. The Note of the Cock is very agreeable, not much unlike some of the *Parus* Kind. I do not remember that I have seen any of these Birds in the Summer before.

Of the Yellow  
Gurnard, by  
Dr. Tyson,  
n. 293. p. 1749.

XXII. If we may justly infer an Identity of Species in Fishes, from the Likeness of their Fins, we have then some Ground to conclude, that this Fish ought to be referred to the *Gurnard* kind. Not but that in many Particulars, and those very remarkable too, it differ'd from it. However, not finding any other Species it agreed with better; and the Fishmonger not knowing any Name 'twas call'd by where taken, which was about *Hastings* in *Sussex*; I shall take the Liberty to call it the *Yellow Gurnard*: and that I had some Colour of reason for doing this will appear, when I have compared this Fish with the *Red Gurnard*, and shew'd wherein they agreed or differ'd. And first as to the general Shape of their Bodies I found an Agreement enough. In both, the Head was the biggest part; the Body thence gradually still lessening and growing taperer, as it approached the Tail, where it was very small in both. The *Yellow Gurnard* measured eleven Inches in length, whereof the Tail was two. The Girth of the Head was four Inches and a half.

The Fins, as to Number and Situation, or placing on the Body, were exactly the same in both; I shall therefore omit their Description, and only take Notice wherein they differ'd in other Circumstances. As in the fore Fin on the Back of the *Yellow Gurnard*, there were four or five *Radii* or Spines; whereof the first was six Inches long; the next about two; the others shorter. In the *Red Gurnard* in this Fin were six strong bony Spines, sharp pointed; whereof the  
second



second from the Head being the longest, was only a little above an Inch, and the rest not much shorter. Note, the *Red Gurnard* I had to compare with, was but small, and something less than the *Yellow* one. In the hinder Fin of the Back of the *Yellow Gurnard* there were nine *Radii*; in the *Red Gurnard* fourteen; in both, the *Radii* near the Tail were the longest; those in the *Yellow Gurnard* being two Inches and half long. The Membrane that joyned these *Radii* of the Back Fins, as to Colour differ'd very much in these Fishes. For in both the Back Fins of the *Red Gurnard* this Membrane was all of a White transparent Colour. In the fore Fin of the *Yellow Gurnard*, the Membrane was yellowish with blue Spots, and some edged with black, and the Membrane of the hinder Fin was of a faint bluish Colour, with four yellow Lifts or Streaks about a Line broad, running the whole length, as in the Figure.

The *Pinnæ Bronchiales* (whereof there were two of each side, and their Situation in both the same, the uppermost being inserted Perpendicular, the lowermost Horizontal to the Body) differ'd in Colour. For in the *Yellow Gurnard* the uppermost Fins were white, the lowermost of a dark blackish Colour, with several beautiful long Spots of an azure Blue. In the *Red Gurnard*, the uppermost Fins were of a dark reddish Colour; the lowermost white: But between these two Fins I observed 3 naked *Cartilaginous Radii*, which are not in the *Yellow Gurnard*, and are well expressed in *Salvianus's* Figure of the *Red Gurnard*. The Fin on the Belly was plac'd exactly alike in both. The *Yellow Gurnard* here had nine *Radii*, and its Membrane of a darkish blue Colour. The *Red Gurnard* had seventeen or eighteen *Radii* here, and its Membrane transparent white. The Tail in both was much the same. Over the *Anus* in the *Yellow Gurnard* was a slender pendulous Body, which was not observed in the *Red Gurnard*. The Colour of the Body of these two Fishes differ'd likewise very much; and I know not, but that it may be a Property in this Species to vary in Colours, more than other Fishes do. The Belly of the *Red Gurnard* was of a Silver Colour, and some Part of the Sides near the Belly: the rest, and the Back and the Head, were of a reddish Colour. In the Head there were some small whitish Spots. The Belly of the *Yellow Gurnard* was white, but under the lower Jaw was black. The Sides and Back were yellowish; but between the Sides there ran a blue Streak or Lift about a Line and a half broad from the Head to the Tail; and a little higher on the Sides there was a Chain of blue Spots the length of the Fish; for on the Sides of the Head I observed these blue Spots, only from the Eyes to the end of the *Rostrum* the Spots were of a deep yellow Colour. There being therefore so much blue and yellow over the greatest Part of the Body of this Fish, I have given it the Epithet of *Ceruleo-flavesceus*; for, where the Ground is blue the Spots are yellow, and where yellow the Spots are blue.

Though hitherto there seems a tolerable Agreement between these



two Fishes, yet in the Remarks I shall now add, the Disagreement will appear greater. For the *Yellow Gurnard* was without Scales, I therefore call it *Lævis*. The *Red Gurnard* had not only Scales on the Back, but likewise a Ridge of spiny Scales all along the Sides; as also of each side the Back Fins were placed the like spiny Ridges or Scales. But the Belly seemed almost smooth, and had but few Scales, and those very fine; and indeed those on the Back were much smaller than those in most other Fishes. If Mr. *Leewenhoeck*'s Observation be true, that even the *Anguillous* Kind are Scaly, then the Difference will not be so great, the one having *Membranulous* Scales, the other bony. Or it may be our Subject is an intermediate Species between the *Gurnard* Kind and some other. And this I am the more apt to believe, because, though it has Gills of each side, yet it had not those Apertures at the sides of the Head that the *Red Gurnard* had, and is common to most Fishes but the *Cetaceous* Kind; but, like them, the *Yellow Gurnard* had two Apertures, or large *Foramina* placed on the hinder part of the Head, an Inch beyond the Eyes, at which it spouts out the Water. By blowing into these Holes I extended the Cavities where the Gills lay; and observed that over these Cavities was placed a flat Bone, which by the Contraction of its Muscles might serve to force the Water out, and perhaps is assisted in this Action by another loose Bone that lies over it, whose Edges are jagged or indented, as in the Figure: At which Place in the *Gurnard* I observed a strong sharp Spine.

Plate 17.  
Fig. 1.

These *Foramina* in the Head of this Fish is a thing so very remarkable, that it may be look'd upon as a Characteristick; nor do I know at present what other Fish to parallel it with: For the *Cetaceous* Kind that have Spouts in their Heads, have not *Bronchiæ*, but Lungs. The better therefore to distinguish this Fish, I have added this Particular to its Name: And could wish, that instead of those silly Names that are given to most Fishes, others were found out, that might be more expressive; and that their Classes were so order'd by such specific Differences, that one might better know where to range them, as in a good Perfection is now done in the Vegetable Kingdom, which is more numerous. I observed the Eyes in the *Yellow Gurnard* were placed more on the Top of the Head, and the Skin here covered almost half of them, like an Eye-lid; which I did not observe in the *Red Gurnard*, whose Eyes were placed more at the sides of the Head. The Head likewise of the *Red Gurnard* was more protuberant, in the *Yellow* flatter. The End of the *Rostrum*, the Teeth and Tongue in both were exactly alike; only in the Palat of the *Yellow Gurnard* I observed two Cartilaginous Bones, whose Edges were bended downwards from the Palat, and did serve, as I supposed, for the hooking in and staying the Cartilage of the Tongue, when it makes a Compression for the forcing out the Water by the *Foramina* of the Head: Which Contrivance I did not find in the *Red Gurnard*, not having the like Occasion for them. This Fish being stale, I had not an Opportunity





Fig. 1.

Fig. 2.

M. V. 3<sup>re</sup> Gueche. Sulp.







nity of dissecting it, and observing the *Viscera*: And shall only farther add, That the Gills had four Osseous *Radii* of each side.

XXIII. The curious Shell Fish was sent by Mr. Foster, a Regent in the College of *St. Andrews*, to our College of *Edinburgh*; several of them, he says, were taken upon the sides of a Whale that was cast in there. Such another was cast in in *Edinburgh-Firth* some thirty Years ago. It is the *Balanus Balanæ cuidam Oceani Septentrionalis adhærens* D. Mart. Listeri, *Hist. Conchil.* The *Pediculus Cæti* of *Bocconi*, who for ought I know, was the first that mention'd it, in his *Recherches & Observations Naturelles*. His Description of the Shell is better than the Figure he giveth of it. I presume to give you my Remarks upon it.

The Shell approacheth to a Sexangular Figure, and consisteth of one Valve, in which Point it differeth from all the *Balani* I have seen: It hath no Spiral Circumvolutions nor Apex, but it openeth at both ends; the Orifice of the upper end is narrower, and it is through it that it puts forth its *Cirrhi* or *Brachia*. The Orifice of the lower end is much broader, and the Animal is lodged in it. The lower is divided, as *Boccone* observeth, into eighteen Lines, which are raised, twelve of them are simple and straight, and the other six are branched: The last are so placed, that two straight Lines are betwixt each of them. There is a Cavity betwixt all of them, in which the *Cirrhi* or Arms of the Animal are probably placed, though in this subject they stood in the middle of the upper part of the Shell, with their ends contracted as the Figure sheweth them; for the upper Orifice is deeper than the lower. They are altogether within it, but we raised them with the Leg of a Compass to the Posture they appear in the Figure. There is an opening from the under part to the upper, by which these *Cirrhi* mount from the Head of the Animal. The Orifice of the upper part is narrow below, but wide in the middle, and then again contracts somewhat. The Body of the Shell is Convex; it hath six Divisions, each consisting of four Tubes extuberant; which are narrower at the upper end, but grow sensibly wider towards the lower end: The utmost of these Tubes are narrow, the middle are broader, all of them have *Striæ* crossing them; the Distances betwixt the Parts of them are smooth and appear hollow; the Superficies of them are wider at the Top and grow narrower sensibly towards the Bottom. All the Tubes are hollow in the inside, making Cavities betwixt the Lines, both simple and branched, which compose them. They arise from the Orifice in the middle of the inner Part of the Shell, and proceed toward the sides of it; the branched Part is nearest the side of the Shell. This is what I could observe of the Shell, upon both the outer and inner side of it. To come now to the Animal: In the upper Part it appear'd like a Mouth gaping; the upper and lower Parts were both semicircular, but narrower towards the Point of the Overture: They were membranaceous; and took their Rise from the inside.

Fig. 2. Pl. 17.  
A Shell-Fish,  
by Sir Robert  
Sibbald.  
n. 308. p. 2314.



inside of the Shell. The upper Lip, if I may so call it, was altogether membranous, the lower seemed of an osseous consistence towards the Shell, and appear'd like the *Dentes molares*: A little below the Mouth appear'd the *Cirrhi*, which were continued with the rest of the Body of the Animal. I doubt not but when the Animal is alive, the under part below the *Cirrhi* doth resemble the under part of the *Mollusci* of the *Polypode* kind: This did resemble the *Parenchyma* of a *Buccinum*, but was much firmer, and when it was pressed it yielded a fat Juice; it was white without, but blackish where it adhered to the Shell; it was all drawn up within the under part of the Shell, which it filled: It was somewhat exsiccated, and so I could not perceive any distinction of parts in it, tho some are of opinion there may be *Viscera* and *Vessels* traced in it when the Animal is newly taken. This is what I could observe of the *Parenchymous* substance in the lower part. In the Figure are two Sinewy Bodies, which arise from the sides of the upper part of the Shell, the one exactly opposite to the other; they end as it were in two Claws; by these it is like the Animal attacheth it self to any thing; and by these it hung to the Whale; it can dilate and contract them as it pleaseth.

Of the Usefulness of the Silk of Spiders, by Monf. Bon. n. 325. p. 2.

XXIV. I shall reduce all the different sorts of Spiders to two principal kinds, viz. such as have long Legs, and such as have short ones: The latter of which furnishes the Silk I am now speaking of. In respect of their particular differences, they are distinguish'd by their Colour, some being Black, others Brown, Yellow, Green, White, and others of all these several Colours mixt together. They differ likewise in the Number and Position of their Eyes; some having six, others eight, and others ten, differently placed upon the top of the Head, as may easily be seen by the naked Eye, but much better by the help of a Glass. These are the principal Differences, they being alike in other respects as their Body, which Nature has divided into two parts: The forepart is covered with a Shell or hard Scale set with Hairs; it contains the Head and Breast, to which are fix'd its eight Legs, each of them consisting of six Joints. They have likewise two other Legs, which may be called their Arms; and two Claws, armed with two crooked Nails, and joyned by Articulations to the Extremity of the Head: With these Claws they kill the Insects they feed on, their Mouth being immediately underneath them. They have likewise two small Nails at the End of each Leg, and a spongy Substance between them, which undoubtedly is of Service to them when they go upon smooth Bodies. The hinder Part of the Body of this Insect is joyned to the fore-part only by a small Thread, and cover'd with a thin Skin, on which are Hairs of divers Colours: It contains the Back, Belly, Parts of Generation and the *Anus*.

It is certain, that all Spiders spin their Thread from the *Anus*; about which there are five *Papillæ*, or small Nipples, which at first sight one would



would take for so many Spindles, that seem to form the Thread: I have found these *Papillæ* to be Muscular, and furnished with a Sphincter. A little within these I have observ'd two others, from the middle of which issue several Threads, in a pretty large quantity, sometimes more, and sometimes less, which the Spiders make use of after a very Mechanical manner, when they have a mind to go from one place to another. They hang themselves perpendicular by a Thread, and turning their Head towards the Wind, they shoot several others from their *Anus*, like so many Darts: And if by chance the Wind, which spreads them abroad, fastens them to any solid Body, (which they perceive by the resistance they find in drawing them in from time to time with their Feet) they then make use of this kind of Bridge to pass to the place where their Threads are fixt. But if these Threads meet with nothing to fix on, the Spiders continue to let them out further, until their great length, and the force with which the Wind drives them, surpassing the weight of their Bodies, they find themselves to be strongly drawn; and then breaking the first Thread, which they hung by, they let themselves loose to be driven by the Wind, and flutter on their Backs in the Air with their Legs stretch'd out. And by these two ways it is, that they pass over Roads, Streets, and the largest Rivers. One may himself wind up these Threads, which by reason of their being united together, seem to be but one when they are about a Foot in length; but I have distinguish'd them into 15 or 20 at their issuing from the *Anus*. What is further remarkable, is the easiness with which this Insect moves its *Anus* every way, by means of the Rings that border upon it. This is absolutely necessary for 'em, in order to wind up their Threads or Silk, which in the Female Spider is of two sorts.

The first Thread that they wind is weak, and serves them for no other use than to make that sort of Web, in which they catch Flies: The second is much stronger than the first; in this they wrap up their Eggs, and by this means preserve them from the Cold, and secure them from such Insects as would destroy them. These last Threads are wrapped very loosely about their Eggs, and resemble in form the Bags of Silk-Worms, that have been prepar'd and loosen'd between the Fingers in order to be put upon the Distaff. These Spiders Bags (if I may so call them) are of a Grey Colour when they are new, but turn blackish when they have been long expos'd to the Air. It is true, one may find several other Spiders Bags of different Colours, and that afford a better Silk, especially those of the *Tarantula*; but the scarcity of them would render it very difficult to make Experiments upon them; so that we must confine our selves to the Bags of such Spiders as are most common, which are the short Leg'd ones. These always find out some Place, secure from the Wind and the Rain, to make their Bags in; as hollow Trees, the Corners of Windows or Vaults, or under the Eaves of Houses. And by getting together a great many of these Bags, it was that I made this new Silk, which is no ways inferior in Beauty to common



common Silk. It easily takes all sorts of Colours; and one may as well make large pieces of it, as the Stockings and Gloves which I here present you. I shall next proceed to show the manner how I prepared the Bags to make the Silk.

After I had got together twelve or thirteen Ounces of these Spiders Bags, I beat them well for some time, with the Hand and a small Stick, to free them from Dust. Then I washed them in warm Water, till the Water that came from them was clear. After this, I let them steep in a large Pot, with Soap, Saltpetre, and some pieces of Gum-Arabick; and let the whole boyl two or three Hours over a gentle Fire. Then I washed them again with warm Water, to free them from the Soap: And having let them dry for some Days, I loosen'd them a little between the Fingers, that they might be more easily carded by the common Silk Carders, excepting that I caused them to use much finer Cards. By this means I had a Silk of a very particular Ash-colour, which is easy to be spun, and affords a Thread much stronger and finer than that of common Silk. Which shows, that all other sorts of Work may be made of it: And there is no reason to fear but that it will endure any Tryals of the Loom, after having passed that of the Stocking-Weavers. The only Difficulty now lies in procuring a sufficient quantity of Spiders Bags to make any considerable Work of it. And this would be no difficult Matter, if we could breed Spiders as they do Silk-worms; for they multiply much more, and every Spider lays 6 or 700 Eggs, whereas the *Papilio's*, or Flyes of Silk-worms lay but 100, or thereabouts: And of this Number we must abate at least half on account of their being subject to several Diseases, and are so tender, that the least Matter hinders them from making their Bags. Whereas on the contrary, the Spiders hatch of themselves, without any Care, in the Months of *August* and *September*, in fifteen or sixteen Days after they are laid; and the Spiders that laid them die some time after. As for the young Spiders that are bred from these Eggs, they live ten or eleven Months without eating; and continue in their Bags, without growing either bigger or less, till the hot Weather forces them to come forth and seek Food. The Reason of this is plain and natural: For all Insects, and a great many other Animals, as Bears, Serpents, Mountain Rats, &c. that lye hid during the Winter, abound with a viscid Matter, which is not easily put in Motion: So that it is not strange, that young Spiders should live in the cold Weather upon their own Substance, without Loss of their Spirits. But as soon as the warm Weather comes, it puts in Motion this Matter, and forces them to spin, and run from place to place in search of Food: And as soon as they begin to eat, one may perceive them to grow bigger and bigger every Day. From whence we may certainly conclude, that if we could find a way of breeding young Spiders in Rooms, they would furnish us with a much greater Quantity of Bags than Silk-Worms do: For I have always found



found, that of 7 or 800 young Spiders; there scarce died one in the Year; and on the contrary, of a hundred young Silk-Worms, not forty liv'd to make their Bags.

I ordered to be brought to me all the large short-leg'd Spiders that could be found in the Months of *August* and *September*. These I shut up in Papers, and put them into Pots, and covered the Pots with a Paper prick'd full of Holes with a Pin, as were likewise the several Papers that were in it, that the Spiders might have Air. I fed them with Flies; and some time after found, that the greatest part of them had made their Bags. But I more easily procured a great quantity of them, by promising to pay the same Price for them by the Pound as for common Silk. This Advantage furnished me in a short time with a large quantity: And they assured me, they found no Difficulty in getting them; and that if they were permitted to go into every House, where they saw these Spiders Bags in the Windows, they could furnish me with what I pleased. So that we may easily conclude, that there are Spiders Bags enough in the Kingdom to make large pieces of Work; and that this new Silk which I propose, is not so scarce or dear as common Silk was at first. And so much the more, by reason Spiders Bags, in respect of their Lightness, afford much more Silk than the others; as a Proof of which, thirteen Ounces yield near four Ounces of clean Silk; three Ounces of which will make a Pair of Stockings for the largest siz'd Man. These here weigh but two Ounces and a Quarter, and the Gloves about three Quarters of an Ounce; whereas Stockings of common silk weigh seven or eight Ounces. It is certain a great Advantage may be made of this Insect, which the Publick has always look'd on as troublesome and dangerous, on account of its Venom; but I can assure you, notwithstanding, that Spiders are not Venomous, having been very often bit by them myself, without any ill Consequence. And as for their silk, it is so far from having any Venom, that every body makes use of it to stop Bleeding and heal Cuts; and indeed its natural *Gluten* is a kind of Balsam that cures small Wounds, by defending them from the Air.

Their Silk is useful, not only in respect of the Manufacture it produces; but its Usefulness is much greater, and more essential, on account of the specifick Medicines, that may be drawn from it. It yields by Distillation a great quantity of Spirit and Volatile Salt; and I have found by comparing, that it affords at least as much as common Silk; which of all mixt Bodies yields the most. This Salt and volatile Spirit, which is drawn from Spiders Bags, is very active; as may be judged by the following Experiments. It changes the Tincture of the Flowers of Turnsole into a beautiful green Emerald Colour. It congeles, and reduces to a sort of Snow, the Dissolution of Corrosive-sublimate; whereas the Volatile Alcalies drawn from Human Scull, Hartshorn, and divers other mixt Bodies, only render it white or milky. So that this new Alkali which I propose, being prepared



after the same manner as that which is drawn from the Bags of Silk-Worms, in making the *English Drops*, so famous over all *Europe*, may serve to make other new Drops, which may deservedly be called *Drops of Montpellier*; which we need not scruple to make use of, with much greater Success than the old ones, in Apoplexies, Lethargies, and all Soporose Diseases, by reason of their great Activity: And they will be taken with less Regret, because their Smell is not so foetid and disagreeable.

Explication of  
the Plates:  
Plate 18.

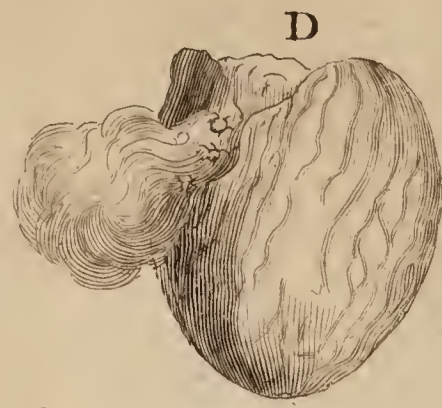
*Tab. 1.* A Shows the Belly of a Spider, with the *Anus* and five *Papillæ*, from whence the Threads issue. BC The side, and fore-part of the *Penis* of a Spider, as magnify'd by a Microscope. D The Follicle or Bag of a Field-Spider with a harder Shell, at the breaking of which the young Spiders come out mixt with the Silk. E The Follicle or Bag of an House-Spider with a softer shell, in which the young ones are inclosed.

*Tab. 2.* F A Spider hanging on the Branch of a Tree, with its Head turned against the Wind, and spinning out its Thread, till it finds that it adheres to some Body, (as to the Wall here represented) by which kind of Bridge it passes over Rivers, &c. G A Spider having broke the first Thread, by which it hung, and let out several others, is carried by the wind, and floats in the Air with its Legs extended.

Of the Pro- XXV. April 27. 1719. I received a small parcel of Silk-worms Eggs  
duction of Silk from *Languedoc*.  
Worms, and of May 6. Early in the Morning I found them hatcht of themselves,  
their Silk in the Wind shifting in the Night from East Northerly to the West-Sou-  
England, by therly, changing the Air of a sudden to warm, two Days before the  
Mr. Barham, Change of the Moon.  
n. 362. p. 1036.

After feeding and managing them according to Art, through the whole Course of their four Sickneses, they were come to their State of Perfection, being then as thick as a Man's little Finger, and from four to five Inches long, of a yellowish Colour, and when held against the Light, they might be seen through as you may an Egg, being of the same Colour and Consistence (fill'd with the Matter that makes the Silk). This is a certain sign that they will begin to spin in twenty four Hours or less. They then forsake their Food (being very voracious before) and hunt about for a convenient Place to fix their first Hold-fasts, for supporting the Balls or Cones they are to make, which they do in a most wonderful Mathematical Manner, with a Mixture of a Gummy Substance that tyes all together; and when the loose furzy substance is taken off, and some of the silk is wound off, the Remainder is so smooth and compact, shining like *Sattin*, that they are made use of for Artificial Flowers, and esteemed the best of any thing yet known for that purpose, for which (only) they are generally kept in *Boarding Schools*. I weighed many hundreds of these  
Silk





TAB. II.









Silk-Balls or Cones, which I found to weigh from 35 to 40 Grains with their *Aurelia's* or *Chrysalis* within them.

June 27. They begun to spin, having been hatcht seven weeks and three days; and in four or five days finished their laborious and curious work: but their Balls were not fit to be removed until eight or ten days.

July 7. *Mons. Lachivre* began to wind off their Silk-Balls with a Machine that made a great Dispatch, winding much fine Silk in a Day: I found that an Ounce of Silk-Balls would make about a Dram of fine Silk; but to be more certain, I weighed out to the Winder twelve Pounds of Silk-Balls at four times, and told the Balls in every three Pounds as followeth, *viz.*

The first 3 Pound contained 812 Balls.

The second 3 Pound contained 842

The third 3 Pound contained 797

The fourth 3 Pound contained 868

So that the whole 12 *lib.* Weight contained 3319 Balls. Which when wound off, was found to yield and make one Pound and one Ounce, or 17 Ounces of fine Silk, and about 7 Ounces of coarse Refuse unwound, in all a Pound and half of *Averdupois* Weight, or two Pounds *Troy*; which is as great or greater making or yielding as in any Part of the World, and the Silk as fine. I shewed it to a noted *Silk Broker*, who said it was *Italian Silk*, (not knowing it was made in *England*) and worth about twenty shillings *per* Pound, if I had never so many Bales of it, &c.

Now upon this Experiment finding that 3319 Silk-Balls would make one Pound and one Ounce of fine Silk, I was desirous to know what quantity of Silk might be expected from the Worms hatchd from one Ounce of Eggs. Of which to obtain the Knowledge, I made use of the following Method: by often weighing and telling I found that one hundred Eggs weighed but one Grain, so that if one Grain contains 100, a Scruple must contain 2000, and a Dram 6000, and an Ounce, at 8 Drams to the Ounce, must contain 48000 Eggs. Now if every Egg hatch a Worm, and every Worm makes a Silk-Ball, there must be from one Ounce 48000 Silk Balls; and if 3319 Balls will make one Pound and one Ounce of fine Silk, (which by Experience I found they did) then 48000 Silk-Balls will make 15 Pounds and 6 Ounces of *Averdupois* Weight in fine Silk, or 18 Pounds and 8 Ounces of *Troy* Weight, which is very considerable. And in the same Proportion one Pound of Silk Worms Eggs, will produce Worms sufficient to make above 180 Pounds of Silk. But allowing for Casualties, and supposing but 12 Pounds of fine Silk made from the Worms and their Silk-Balls produced from an Ounce of Silk Worms Eggs; it will be found much to exceed most Countries, according to *Augustino Gallo's* Computation: For he saith, that in the Southern Parts of *France*, *viz. Languedoc* and *Provence*, they make but seven or eight Pound of Silk from Silk-



Worms hatched from an Ounce of Eggs; and in *Brescia* in *Italy*, but eight, nine, or ten Pound of Silk from an Ounce; only in *Calabria*, where the Silk-Worms and their Eggs are larger, they make eleven or twelve Pounds of Silk from an Ounce of Eggs; which still doth not exceed, nay hardly comes up to, what we make in *England*. Experience hath taught me how to hatch Silk Worms twice in a Year, so as to have two good Crops of Silk in one Year. And that Mulberry Trees will have Leaves in *England* twice in a Year, without Prejudice to either Tree or Fruit, is most certainly true.

Of Insects in  
the Barks of  
decaying Elms  
and Ashes. by  
Sir Matthew  
Dudley,  
n.296.p 1859.

XXVI. About five or six Years since, I removed divers Elms, more than six Inches Diameter, which for the first two or three Years all thrived very well; but two or three Years ago there happening a very dry time in *July* or *August*, I observed one of those Elms which stood very shallow, and on pretty high Ground, looked very sick; the Leaves turned yellow, and began to fall off; which made me with a Knife examine the Bark. I found the inside thereof not so green, but of a more reddish Colour than the others; and between it and the Tree not so moist, and the Bark sticking very close to the Wood: But what was most remarkable, I discerned a great many little black Flyes of the Beetle kind (*viz.* having a hard Case, under which their thin long Wings were contracted, and therewith covered) between the Bark and the Tree: And looking more carefully, I observed these Flies had made their way thither by piercing the Bark in innumerable places, easily discernable on the outside, and was about the bigness of a large Pin hole, or rather such as a large Pin's head would go into; some I found just entring, who had not got quite through the Bark, others had made some Progress between the Tree and the Bark, which appeared as a Channel. I despaired of recovering the Tree; however, my Servants being watering others, I caused them to bestow about two Hogsheads on this Tree, with stirring the Earth about the Roots, and laying some half rotten Litter thereon, to defend it from the scorching Rays of the Sun: Upon this the Tree in some manner recovered its Verdure again that Year, and the next Year made very good Shoots, and so continued until this Year.

But this being a very dry Summer, I discern'd divers of my Trees in the beginning of *August* to look sick, and particularly the Tree formerly mentioned; I made the same Tryal on them all, and found the Bark sticking close to the Tree, with but little Moisture between, and vast Numbers of those little Flyes, who had pierced the Bark in multitudes of Places. I ordered the Earth about the Roots to be loosened as formerly, and about two Hogsheads of Water to be poured on each, and viewing them the next morning, I found the outside of the Tree almost covered with Bees and Wasps, and great black Flyes, such as they usually call Flesh-flyes; who were all busie in sucking the Juice or Sap, which plentifully run out at every Hole that



that the little Flyes formerly mentioned had made in the Bark, and which was very Glutinous, and sweet as Honey. I again examined the Bark, and found it very moist between it and the Wood, and all those little Flyes either gone, or drown'd in their new habitation, by the sudden rise of the Sap; this Tree recovered. Upon Examination of several Trees, which looked sicker than the rest, I found almost all greenness had left the Bark, and there remained no moisture between it and the Wood; but the Bark stuck so close to the Wood it was hardly to be parted: And throughout the whole Tree the Bark was pierced by the aforementioned little Flyes, who from the hole at which they entred, had made each of them a strait perpendicular Channel from their entrance upwards, about two Inches long, or something more, very little, if at all, bigger than just to move themselves strait forwards in; for I observed they all of them, if disturbed, came out backwards. All along on each side this Channel, as close the one to the other as they well could, so as yet to be distinct; there were small Channels running Horizontally from it, in every one of which at the extremity thereof there was a Maggot, in size just the bigness of the small Channel, very lively, whitish, and almost transparent. These Trees, tho well watered, received no benefit thereby but dyed. It is to be observed, that in those Trees whose Leaves looked Green and Healthful, there was none of these Flyes to be found.

The Reason of which I presume to be, that whilst there was a sufficient Moisture in the Earth about the Roots, to supply the Tree with a due quantity of Sap, so thin and diluted that it was proper, and capable of being conveyed into the smallest Twigs and Leaf-Vessels, the Leaves kept their Verdure, and the Tree flourished: But when, by reason of the dry season, that supply failed, and the Sun perpetually exhaling the thinnest and more watry parts thereof through the Bark, the Sap already in the Tree became insufficient in quantity, as well as improper, by reason of its thickness, to supply or enter into all those small Vessels: the Leaves lost their Greenness, and fell off, and the Sap became thick and very sweet, (which I have found it is not when it is duly diluted, and the Tree in good health;) this invited those Flyes to make their way to it, as a proper Nursery to bring up their young ones; which I take those little Maggots to be. I presume also, that the Eggs were first laid in the great Channel, (and, it may be, regularly placed at their due distances, in the sides thereof) and after being hatched, made those small Channels themselves; since those small Channels are no way capable of receiving the Old Fly, and that the Maggot is always found at the farther end of the little Channel, and the rest of the little Channel is perfectly filled with very small Particles, which, when dry, became fine Dust; and I conceive to be either the Excrements of the Worm, or parts of the Bark ground small by the Teeth of the Worm, to make its way forwards, and rejected as not proper Aliment, or both.

About



About the middle of *October* I found those little white Maggots, and consequently their Channels, which they exactly filled, were grown much bigger, and had made their progress from the place where they were first hatched, which was close to, or upon the very Wood of the Tree, almost to the very outside of the Bark of the Elm, which is usually pretty thick; and in every one of those Perpendicular Channels before mentioned, I found the Mother Fly lying dead, for the most part towards the entrance of the said Channel. These Observations put me upon viewing the Wood, which lay in my Yard for Timber or Fuel, and in all the Elm which was felled last Spring, I found the Bark thereof as much pierced; the same Mother Channel, which for distinction sake, I beg leave still, tho improperly, to call Perpendicular (for these Trees lay on the Ground) and the same little (now as improperly called Horizontal) Channel proceeding from the Mother Channels full of Maggots, which Maggots had also made their way almost to the outside of the Bark. Observing some Elm, which had lain much longer in the Yard, and taking off the Bark, I found the same tracks both of Mother Fly and Maggots; and that, at the extremities of almost all the Horizontal Channels made by the Maggots, where they had subsisted long enough to come to any perfection, the Bark was pierced quite through, by a hole just the bigness of the Channel, and nothing left remaining, but a sort of a whitish pretty tough Skin, exactly the Colour and size of the Maggot, at the mouth of the hole, and the rest of the forsaken Channel perfectly filled with what I formerly presum'd to call the Excrement of the Maggot.

Then I examined the Ash-wood, which had lain some time in the Yard, and at first sight, it being young, and its bark pretty smooth, I perceived it full of small holes; and on separating it from the Tree, I found just the same sort of work as in the Elm, and by the same sort of Fly, having found several of the Mother Flyes dead in their Channels, and the same empty Skins at the extremities of the other Channels; only with this difference, that whereas in the Elm all the Mother Channels were Perpendicular, and the Maggot Channels Horizontal, here in the Ash it was just contrary, all the Mother Channels were Horizontal, and the Maggot Channels Perpendicular; this I at first thought might be accidental, and peculiar to that piece of Wood, but on examination of above 100 pieces of Wood of different Trees, and felled at different times, I found it exactly to hold true in them all. I observed several Oak and Maple Trees, which had been felled some in Winter and some in Summer, and the Bark remaining thereon, but could find no such thing in either of them.

Explanation of the Figures. Plate 19. Fig. 1. shews the Bark of Ash. Fig. 2. The Bark of Elm. Fig. 3. The Worm as big as the Life lying on its Back. Fig. 4. The Mother Fly, with its Belly upwards, as big as the Life. Fig. 5. and 6. The Worm and the Fly with their Backs upward. Fig. 7. and 9. The Worm Magnify'd. Fig. 8. The Mother Fly Magnify'd.



fig. 1.

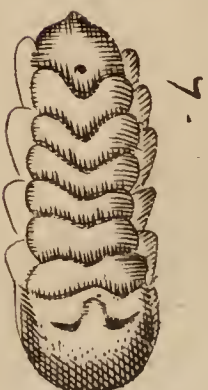


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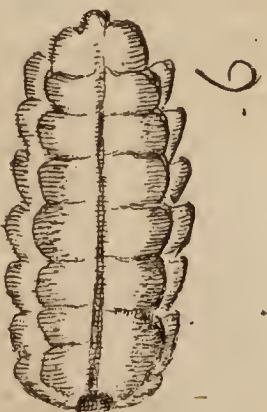
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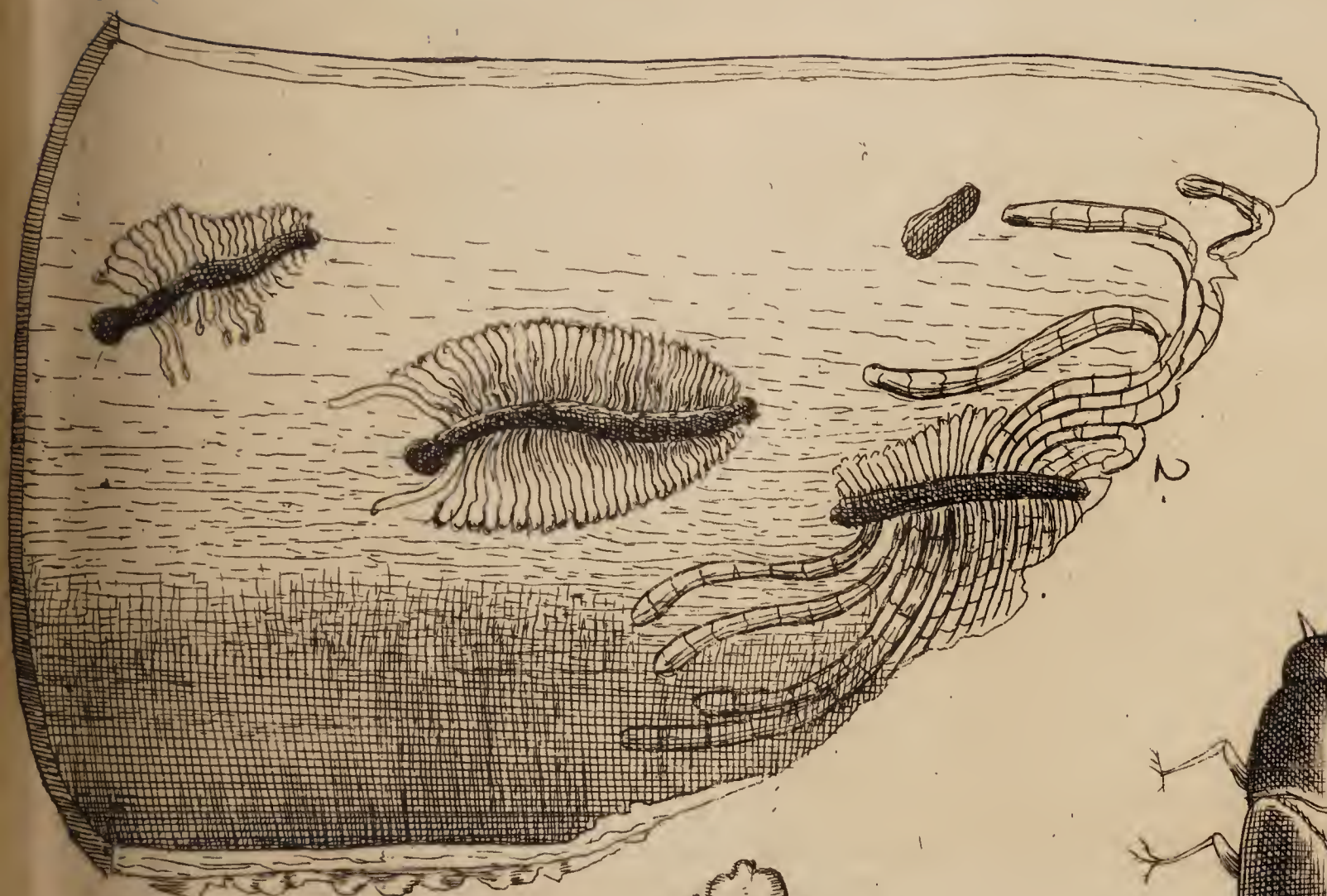
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Death Watch.

10.



10.



11.







XXVII. Of these *Death-Watches* (or Insects which make a Noise like of the Death- the Beats of a Watch) I have observed two sorts. One of them I Watch, by find a very exact and true Account of \*, from which I differ only in <sup>Mr. Derham,</sup> this, that he says, the ticking Noise is made with *the extreme Edge of* <sup>n. 271. p. 832.</sup> *the Face, which may be called the upper Lip*: whereas I observed the In- <sup>\* Phil. Transf. n. 245. Abr. Vol. II. p. 785.</sup> sect to draw back its Mouth and beat with its Forehead. The In- sect there described, being less shy, and much bigger than the other, I discovered some Years ago. This Year I caught many in May, in my Study: two of which (a Male and Female) I kept alive in a little Box about three Weeks; and could make one of them beat whenever I pleased, by imitating his Beating. At last one died, the other gnawed his Way out through the side of the Box. The reason why I judge these to be Male and Female is, because I have often by my Ticking noise invited the Male to get up upon the other in way of Coition. That which I took to be the Male was somewhat lesser than the other, he would beat very eagerly; and when he found that he got up in vain, he would get off, and beat again eagerly, and then up again. From whence I guess these Pulsations to be the way whereby these Insects woo one another, and find out, and invite each other to Copulation.

The other *Death-Watch* is an Insect in appearance quite different from the last; which I lately discovered about the beginning of July. The other *Death-Watch* beateth only seven or eight Strokes at a time, and quicker: but this will beat some Hours together, without Intermiſſion; and his Strokes are more leisurely, and like the Beats of a Watch. I have several Years observed these two sorts of Beating, but took it to be made by one and the same Animal. The Insect which makes this long Beating, is a small greyish Insect, much resembling a Louse, when looked on only with the naked Eye. For which Reason (for want of another Name) I call it *Pediculus Pulsatorius*. It is very nimble in running to seek its Shelter, when disturbed. It is very common in all Parts of the House, in the Summer Months. They are extremely shy of Beating, when disturbed; but will beat freely enough before you, and also answer you when you beat, if you can view them without giving them Disturbance, or shaking the Place where they lye, &c. I cannot tell whether they beat in any other thing, but I have heard their Noise only in, or near Paper.

Concerning their Noise, I am somewhat in doubt, whether it be made by their Heads, or rather Snouts against the Paper: or whether it be not made after some such manner, as Grasshoppers and Crickets make their Noise. I rather incline to the former Opinion. But my reason of Doubting is, because I have observed the Animal's Body to shake, or give a sudden Jirk at every Stroke, but I could scarce perceive any Part of its Body to touch the Paper. 'Tis possible it might beat the Paper, and I not perceive it, by reason its Body is small,



small, and near the Paper when it beateth, and its motion in beating is sudden and swift. For which Reasons also it is hard to perceive the Insect to beat, without a very severe Eye: And therefore I made use of a Convex glass, which by magnifying gave me much better Opportunity of observing. This ticking Noise, I judge (as before) a Wooing Act; by reason I observed another (after much beating) to come, and make Offers to the beating Insect: who (after some Offers) left off his beating, and got up upon the Back of that other. When they had conjoyned, he got off again, and they continued some Hours joyned Tail to Tail like Dog and Bitch in Coition. The Female (which I saw) was somewhat bigger than the Male, and lighter in Colour (inclining to a yellow:) but whether all are so, I know not.

I have often heretofore by the Noise pursued the Makers of it; but have thought my self disappointed, when I found nothing but some of these *Pediculi*, which I did not perceive to beat, and which I little imagined could have made so sonorous a Noise, as I have heard some of them do, even as loud almost as the strongest Beats of a Pocket-Watch. But lately finding a piece of Paper in my Study, in which I was sure the Beating was, and it being luckily loosely folded, so as to be viewed throughout, and also happening to lie in a good Light, I strictly viewed it, but could only see some of those *Pediculi*. And viewing them with a Convex-Glass, I soon perceived some of them to beat, or to make a Noise, with a sudden shake of their Body, as hath been described. And I am now so used to, and skilful in the matter, as to be able to see, and shew their Beating, almost when I please, by having a Paper with some of them in it conveniently placed, and imitating their Pulsations; which they will readily answer. Whether this Insect changeth its shape, and becometh any other Animal, I know not: but I have some Cause (tho very little) to suspect that it becometh a sort of Fly.

n. 291. p. 1586.  
Plate 19.

Fig. 9. Sheweth it as seen with the naked Eye: Fig. 10. as magnified. It is very much like a Louse in Shape and Colour, but runneth more nimbly.

Its Generation.

Some time after their Copulation (of which by and by) they lay their Eggs in dry, dusty Places, where they meet with least Disturbance: For in such, and none else, I have found them. These Eggs are exceeding small, much smaller than the Nits of Lice; although Lice are not much bigger than our Insect is. These Eggs are white and shap'd like Nits, but more transparent. These (as the Eggs of all Insects, that have fallen under my Cognizance, are by the warmth of the Weather) these, I say, are hatched by the Warmth of the approaching Spring; which is to them all one as an Incubation. About the beginning of *March*, or (if the Weather be warm) sooner, if cold and unseasonable, later, the Insect is fully hatched, and can creep about.



about. At the first leaving their Egg-shell, they are exceedingly small, so as scarce to be discerned by the sharpest Eye, without the help of a Convex-Glass. I have with a Microscope seen them crawling about, but could scarce perceive any Hairs, Feet, &c. But they rather look'd like moving Eggs. I suppose they were covered with their Shells, and but just breaking out of them. At the first leaving their Shells they are lesser than their Eggs, although the Eggs are scarce visible without a Microscope. These young Death-Watches are perfectly like the Mites in Cheese, a few Hairs of the Breech only excepted. I could not perceive any Difference between them, when much magnified with a Microscope, but only that Mites have more Bristles about their Breech.

In this Shape they continue six Weeks, or two Months, feeding on divers things they can meet with. They being (as I said) so very like Mites, I cannot positively say, but have great reason to think, that they were Swarms of young Death-Watches, which I have seen feeding on dead Flies, and other things in *March*, *April* and *May*. Indeed they are a great Annoyance to me, in devouring or defacing my Specimens of Insects. And there are scarce any sorts that escape these voracious, tho minute Animals.

From this *Mite State*, they grow gradually to their more *perfect State*. When they become like the old ones, they are at first very small, and then can run about more swiftly, than when Mites, in which Mite state, they creep but slowly.

Thus having traced the Generation of our Insect through its several stages, and finding it to be as solemn and regular as any in Nature, even as that of an human *Fœtus* it self, I cannot easily pass over the Business of *Aequivocal Generation* without a Reflection. If this Insect was ever taken Notice by the Ancients (as I do not find it was by them, and but little by the Moderns) they would, no doubt, have made its Production to be (like that of other Insects, *viz.*) out of Dust, or some other thing, in which its Eggs were laid. But as in this, so in the Generation of all other Insects, yea all other Animals, it hath been observ'd, that Nature is very regular, and uniform in deriving the Off-spring, not from corrupted Matter, but from Animal Parents of the same Species. I have collected near thirty distinct Species of Gnats, and have observed one Species to lay its Eggs, in this, another in that, another in a third, and others in other Forms; and I could not but admire how artificially the Spawns are tied in the Water; how (after the Sun's Incubation, if I may so call it) the Spawn is dissolved, and the Eggs with a part of the Gelly in which they were inclosed, fall to the bottom of the Water, and there stick on Stones and other things; where they are hatched into *Nymphæ*, as various as the Gnats themselves, some being red, green, white or other colour'd Worms, some of a quite different Shape: and lastly,

E e e

how



how these *Nymphæ* become *Aureliæ*, and then Gnats, both Male and Female of every Species.

*Its Ticking  
Noise.*

Their Ticking Noise is plainly a wooing Act, and is commonly about *July*. I scarce ever heard them beat before *July*. But all, or the greatest part of *July* they beat, and in the beginning of *August*. I have heard them till *August* 16. but never later. But they do not beat every Year alike; but sometimes sooner, sometimes later; sometimes much, sometimes little; according as the Year excith or favoureth, or hindereth their Venereal Inclinations. Of which we have sufficient Example in the last, and present Year. The last Year 1702, they ticked very much, scarce ever ceasing either Day or Night. But this Year 1703 as little. And I have observed as great a difference in the Fertility of other Insects the last and this present Year. And no doubt but the same befel our Death-Watch. The most remarkable Difference, or at least the most perceivable was in Insects bred in the Waters.

As to the Waters, it might be observed, that last Year they extremely abounded with Animalcules. You could hardly find any stagnating Water without many Animalcules of many sorts therein, visible to the naked Eye. And if you viewed a small Drop thereof with a good Microscope, you might see very many more. So that the Water looked in a manner as if alive. But this Year I have found some, but very few of those Animalcules, either without or with a Microscope. The *Pediculi Aquatici* (which *Swammerdam* calls *Pulices Aquatici Arborecentes*) which are seldom barren, were for instance less numerous in our Waters this last Summer, than the Summer before, by many myriads, or at least less venereally inclined, or less pregnant, as I judge, from there being vastly less numbers of them congregated together. For the reason of their assembling in such vast Numbers so as to discolour the Waters, I have discovered to be either for Venerly, or to discharge their Young at least out of the Receptracles wherein they were lodged, or to cast their *Exuviae*, or Skins, or for all together. For I have seen all these things performed at that time, if I mistook not. Now as these most numerous fertil Insects, so our Death-Watch, in all probability, had its venereal Flames abated by the Indisposition of the present Year; and consequently (as I said) have clicked but little this Year. The reason of all which I take to be the Wet of the Spring Months, especially *May*, and *June* last. In the former of which, there fell more Rain here at *Upminster*, than in any Month of any Year since 1696. This vast Wet might not only chill and spoil the Eggs of the Water Insect, but also indispose the Air, and by some such Means affect all other Insects and render them less Prolifick.

After this Noise they copulate. I do not remember that ever I found them in Copulation, till a Week or Fortnight after their Ticking.

But



But 'tis very probable that they do copulate in the Time of their *Ticking*, as I have formerly shewn the *Scarabæus Death-Watch* to do.

I have already said that the young *Death-Watches* feed upon dead Insects, and the same I have seen the old ones do also, as also upon divers other things, *viz.* Bisket, Tallow, &c. Nay, Dust itself (although it may seem to us an improper Food for such *Animalcula*) doth not escape the Palate of our *Death-Watch*. For which reason probably it is, that they delight most in dusty places, not in all, but such as are fouled with light Dust, such as flyeth in sweeping, and falleth on Shelves, and other places seldom brushed down. But in this their eating Dust, there is one thing very remarkable, *viz.* their curiosity in choosing it. For they do not eat all that they meet with, but are very nice, and curious in selecting what suiteth best their Palate. I have seen them turn the Dust, and hunt among it with great pains and diligence. From hence I conclude, that our *Death-Watch*, and other Creatures too that eat Dust, are not nourished by the pure terrene particles of Dust, but rather by more nutritive particles intermixed with Earth. For Dust contains very different particles, some of Earth, some the Powder of Animals, some Crumbs of Bread, Cheese, and other Provisions reduced to Powder, some particles of Fruits, or our Spittle, Snot, &c. dried and reduced in like manner to Powder. Now these very Particles of the Dust are doubtless what the *Death-Watch* hunteth after (like Ducks in Mud) when he turneth up, and diveth among heaps of Dust. Nay, so far probably is his Food from being corrupted, or fouled by the terrene particles, that it is perhaps better prepared, by thus being in the Dust. Before in a Mass, in the body, it was more solid, and required the trouble of being gnawed out and masticated, but being thus in Powder, it is ready subtilized fit for deglutition. And although Dust to us seems to be nothing but Dirt pulverized, or if consisting of such Particles also as I have said, yet to be so blended and mixed with Dirt, as to be inseparable. But yet it is otherwise with our Insect. I have seen them through a Microscope select the particles of Dust, and eat some and reject many others: Which they can easily do, being small themselves, and having accurate Organs of Sight, Smelling and Feeling, as well accommodated to Dust, as the Organs of Ducks and Hogs are to find their Food in Dirt.

I cannot forbear here to note a common error about the food of such Creatures, as have been, or are thought to live upon things scarce nutritive of themselves. Thus the *Chamæleon* was thought to live upon the Air, when Flies are eaten by him: Fishes to live upon Water, or at least to satisfy a perpetual thirst therewith; whereas their sucking Water is breathing, and their Food as little of Water perhaps, as other Creatures use. So *Earth-Worms* doubtless eat Earth, but in all probability it is Earth made of rotted Roots, Plants, or such nutritive things, not pure Earth. Nay, so necessary is good substantial Food to all Animals on this our Earth, that I am of opinion (from I think very good Reason)



Reason) that there is no Animal but what hath its proper Food, even the most minute Insects whatsoever, and that also none of the four Elements, although therewith mixed\*.

\* v. Ray's  
Wisdom of God

P. 431.

Of Insects in  
Spain by Dr.  
Breynius. com  
by Mr. Petiver.  
n. 301 p. 2051.

Plate 20.

Tab. 10.

XXVIII. Tabulæ primæ Fig. 1. Locustam exhibet, quæ an descripta sit, necne ignoro, certe mihi videbatur rarissima. Coloris erat viridis elegantissimi, figuræ verò & magnitudinis, quæ in figura exprimuntur. Tardè sese movebat alis destituta, quarum locum in tergo, immediate sub clypeo duæ parvulæ, rotundiusculæ, lutescentes occupabant membranulæ. Caput antennis ornabatur longissimis, & articulatis viridibusque pariter. Unicam saltem videbam Oleandro insidentem.

Figurâ 2. adumbratur Insectum, quod ab Aldrovando in Hist. Insect. L. 4. T. 5. f. 2. & 3. nomine Bruchi insolentis figuræ depingitur describiturque; sed descriptio ejus manca est & Icon minime accurata. Caput huic meo Insecto erat oblongum, superne cristatum, & duabus brevissimis antennis antè donatum. Corpus & Crura tenuissima, cauda vero latiuscula, articulata, circumflexa ac in ambitu crenata, simili eminentia per medium excurrente. Quiescens Corpus cum binis anterioribus cruribus complicatis erectum tenebat, progressum vero ijs quoque ad ambulandum utebatur, quæ nihilominus pro arripiendo victu forcipum instar primariò mihi videbantur fabrefacta. Color totius ex cinereo erat luteolus, maculis fusco-nigricantibus interspersis. Unicum duntaxat reperi inter gramina, quod postmodum per decem diès absque ullo alimento servavi superstes, donec tandem fatali vitæ ejus filum abrumperem acu.

Figura 3. Insectum exhibet, quod Moufettus & Jonstonus nomine Mantes describunt & delineant. Ad quod genus meo judicio pertinent ex Aldrovando l. c. T. 1. f. 1. & 2. & T. 3. f. 10. ex Jonstono T. 13. f. 18. 21. 22. & præterea omnia Folia ambulancia dicta ex Indiis delata, quæ minime Vegetabilium folia in ejusmodi Animalcula transformata, uti somniarunt nonnulli, sed Insecta Insectorum modo producta esse, omnibus facilè rem accuratius examinantibus, nec tam faciles aures prodigiosis fabulosisque relationibus præbentibus patebit, opinor. Meum itaque hoc Insectum eandem exacte figuram habebat & magnitudinem, quæ in fig. 3. videntur. Quatuor instructum erat alis, quarum duæ superiores venosæ aridorum foliorum texturam habebant & similitudinem (hæc magis conspicua in Indicis speciebus, unde fabulæ origo) coloris ex flavo fusci; inferiores vero dictis majores quidem, sed subtiliores, nec ita venosæ, flavicantes, nigris maculis aspersæ: Ita ut superiores quodammodo thecarum vices gerere viderentur, ut in Scarabæorum genere observamus. Præterea notanda extremitas ventris bifurca, anteriora crura crassiora, ferrata, uti in Insecto antecedente, quæ etiam ad eundem usum a naturâ instituta. Corpus reliquum colore erat ex fusco luteum.

Cum binorum ultimorum Insectorum figuras Clariss. Vallisnerio forte



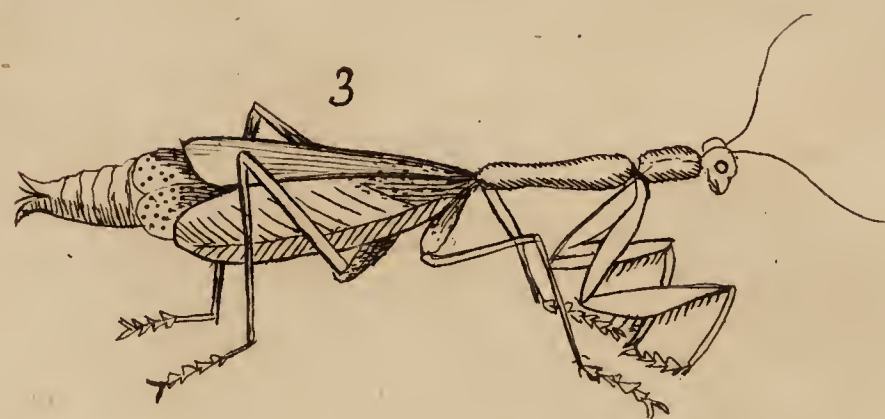
Fig = 1



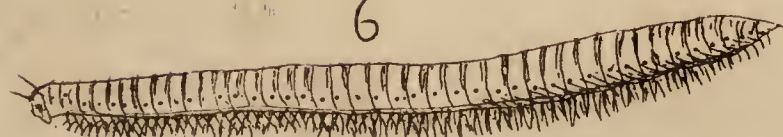
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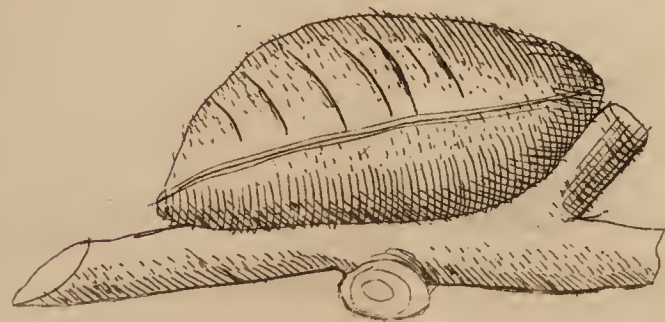
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Fig = 1

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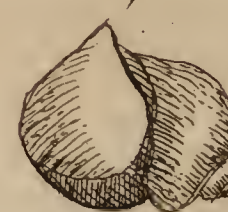
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forte fortuna ostenderem, ipsi, mox ex annotationum suarum Thesauro sequentia de iisdem mecum communicare placuit. Scilicet ab ipso etiam esse reperta in Italia in Scandianis nempe Regii & Coneglanis Collibus, sibi quoque missa ab amicis ex Marca Anconitanâ, Maurata, Liburno & Florentia; se tandem eadem fovisse in suo horto. Esse ejusdem generis Insecta, sexu saltem diversa, marem videlicet illud, quod alis caret Fig. 2. a me depictum, fœminam vero alatam fig. 3. adumbratam. Ab Hispanis dici *Saltamonte*, a Liburnensibus *Cavallo verde*, ab amico suo D. Cestono *Grillo-centaurum*, a se verò *Aranco-Locustum*. Se eadem aliquando observasse meis figuris dimidio majora, fœminam sapius coloris virescentis, unde *Cavallo verde* Italis dicitur. Esse porro carnivorum & jucundo sane spectaculo prædam suam, ut Muscas, Gryllos, Locustas minores, imo nec proprio suo generi parcendo, cruribus anterioribus venari, capere, brevique erectum, ut plurimum devorare; non leve ferociæ & Tyrannidis argumentum. Præterea fœminam unius noctis seu 8. horarum spatio cellulosum suum extruere nidum, podice elevata totum opus perficiente, & reliquo corpore immoto. Antequam verò generationi aptæ sint, fœmellas biennium attigisse opus esse observavit, tumque primum suum elaborare nidum nucis avellanæ magnitudine, qui anno subsequente nucem superat & tertio tandem binas adæquat. Nidificationis tempus esse Autumnum, Mense Majo verò vel Junio anni proximè sequentis inde prodire prolem communis cum parentibus figuræ, sed exilissimam, quæ centenarium numerum plerumque, subinde verò duplicatum, pro magnitudine nidi & matris ætate provectiori, attingit.

Nidi ipsius figuram ante oculos ponit fig. 4. quam ex eo, quo me jam nominatus Vir donavit, desumpsi. Coloris est ex luteo cinerei, videturque compositum ex humore lentescente ex podice emisso & indurato. Rusticis vulgo *Cicala secca* dicitur, qui eundem mortuam aridamque credunt cicadam.

Fig. 5. & 6. representat Lulum, qui admodum erat frequens in terrâ sub plantarum foliis. Colore gaudebat albo, nigris annulis atroque inter annulum & annulum puncto distincto. Caput nigrum quemadmodum & pedes.

Animalcula tria marina, quæ non procul ab Insula Yvicâ Maris Mediterranei, Mense Augusto, à Nautâ quodam Mari tranquillo innatantia reperta ad me deferebantur, subjungere liceat. Omnia in Tabula secunda delineantur. Et primum quidem ex Urticarum marinarum ab Auctoribus dictarum genere est, cujus fig. 1. partem adumbrat superiorem; ejus limbus nonnihil concavus coloris erat cœrulei amœnissimi, medium verò orbis aliquantulum convexum, striisque circularibus ac radialibus ornatum, coloris argentei. Radiorum instar eminentes Appendices à supina parte ortæ, quas satis celeriter remorum instar sursum & deorsum movebat, erant dilutæ cœuleæ & fermè diaphanæ, quarum extremitatibus minutissimi adhærebant subtilissimis suffulti pedunculis globuli ex nigro cœrulei. Hæ autem Appendices levissimæ.

Marine Ani-

mals.

Tab. 2.



levissimâ abradebantur Minervâ, ut totum adeo animalculum utpote valde molle & mucosum destrueretur.

Fig. 2. Exhibet ejusdem partem supinam, quæ præter Appendices jamjam descriptas, filamentis duorum generum exornabatur; primum genus circa marginem positum brevibus teretibusque constabat filamentis dilutè cœruleis & glabris; alterum verò centrum occupans brevissima quidem habebat, ast circa extremum orificioquodam hiantia, colore albo. Hisce animal dubio procul aliis corporibus adhæret capitque alimentum.

Fig. 3. Hujus demonstrat Appendicem Microscopio visam. Cæteræ figuræ omnes naturalem habent suam magnitudinem.

Secundum quod miri Hirudinis marini species & quidem lepidissima videtur. Fig. 4. exponit ejus scilicet tergum, quod nonnihil planum, striâ in medio argenteâ longitudinali elegantissimè pictum, lateralibus lineis obscurè cœruleis; cujus coloris quoque erant pinnæ argenteo intermixto, quas natando celeriter movebat. Latera colore gaudebant dilutè cœruleo, prona vero pars seu venter albo. Capitulum ei erat oblongum duplici barbulâ binisque oculis instructum; os rotundum parvulum, quo variis se rebus, suctione ut puto, affigere solet. In latere sinistro foraminulum conspiciebatur, quod pro ano habebam. Hujus speciei duo vel tria vidi Animalcula, quæ in vitro aquâ pleno paucas intra horas expirabant; dumque in Vini spiritu servare tentabam, mox summopere contrahebantur, colore cœruleo in luteo ferrugineum mutato.

Agmen denique claudat Cochlea (Fig. 5, 6, 7.) quædam colore, quam figurâ, speciosior, rariorque; cœruleo enim tincta erat saturo, aliquantulum, quamvis parum admodum ad roseum quoque vergente. Cæterum erat tenuissima, lubrica, subtilis; animalculum abscondens Fig. 5. expressum quod humorem fundebat ejusdem cum restâ coloris; ipsi adhærebat firmiter aliquid ad instar spumæ viscidæ, qua mediante aquæ innatabat superficiei. Et hæc Cochlea marina ob colorem suum cœruleum adeo rara est, ut nullam huic similem vel descriptam, vel in Cimeliis repositam me observasse meminerim.



XXIX. *Papers of less general Use, omitted.*

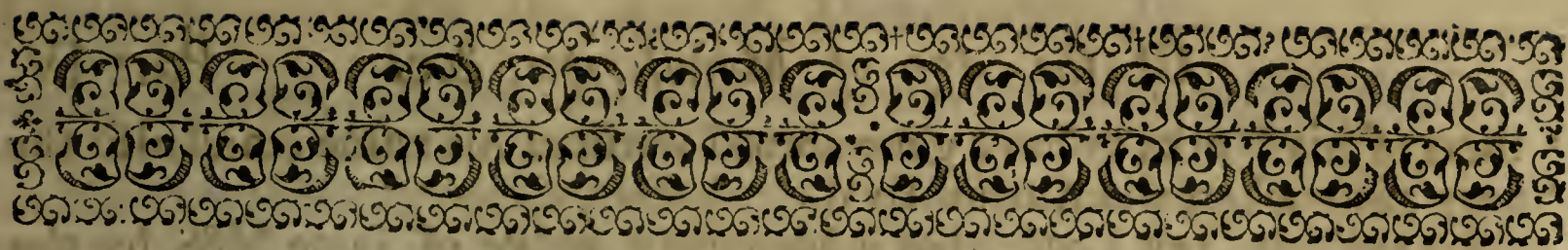
1. Some Observations concerning Insects, made by Mr. *John Banister* in *Virginia*, Anno 1680. with Remarks by Mr. *Petiver*. n. 270. p. 807.
  2. Some Animals sent from the *Philippine Isles*, by *F. Camelli*, to Mr. *Petiver*. n. 277. p. 1065.
  3. Observations on the Birds in the *Philippine Isles*, by *F. Camelli*. n. 285. p. 1294.
  4. Some Animals sent from *Carolina*, to Mr. *Petiver*. n. 299. p. 1952.
  5. Fishes from the *Philippine Islands*, by *F. Camelli*. n. 302. p. 2043.
  6. De *Serpentibus Philippensibus*, by the same. n. 307. p. 2271.
  7. De *Quadrupedibus Philippensibus*, by the same. n. 305. p. 2297.
  8. De variis *Animalibus Philippensibus*, by the same. n. 318. p. 241.
  9. De *Araneis & Scarabæis Philippensibus*, by the same. n. 331. p. 310.
  10. Some Quæries concerning the Migration of Birds, by Mr. *Derham*. n. 315. p. 123.
  11. *Osteographia Elephantina*: Or, A full and exact Description of all the Bones of an Elephant, which dy'd near *Dundee*, April the 27th, 1706. with their several Dimensions. To which are premis'd, 1. An Historical Account of the Natural Endowments, and several wonderful Performances of Elephants, with the manner of Taking and Taming them. 2. A short Anatomical Account of its Parts. And added, 1. An Account of the Weight of all the Bones in this Subject. 2. The Method I us'd in preparing the Skeleton. 3. Four large Copper Plates, wherein are represented the Figures of the Stuff'd Skin, and prepared Skeleton, as they now stand in the Publick Hall of Rarities at *Dundee*; with the separated Bones in several Views, and other Parts of this Elephant. Communicated in a Letter to Dr. *Hans Sloane*, R. S. Secr. by Mr. *Patrick Blair*, Surgeon, &c. n. 326. and n. 327.
- This Relation being printed verbatim in a Pamphlet by it self, and easie to be purchas'd I thought proper to omit it: though it be very well worthy the Perusal of the Curious.*

T H E









T H E

# Philosophical Transactions

From the Year 1700. to 1720.

Abridg'd and Methodically Digested.

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P A R T IV.

## The *Philological* and *Miscellaneous* Papers.

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C H A P. I.

*Chronology, History, Antiquities.*



THE substance of what your Grace is pleas'd to say about Manuscripts and Copied Writings (as I apprehend it) is, 'that 'tis not only possible, but very easie, 'upon the perusal of a written Book, to pronounce 'in what Age or Century it was written, supposing 'a Man to be tolerably well vers'd in Books of that 'Language or Country. And that this judgment 'may be made, only by observing the Shape and Figure of the Letters of the Book, which (as all other things) have their fix'd Periods for their Duration: as being form'd this way in such a Century, and such a way in the next; Time only (which alters the outward state of other things) working this Change in Letters also, of what Age, Language, or Country soever they be.' And then as to Original Compositions, your Grace is of Opinion, 'That the Style and Diction of 'any noted Author being well observ'd, 'tis very easie to discover such o-

I.  
Of the Age of  
MSS. &c. in a  
Letter to a most  
Rev. Prelate,  
by Mr. Wan-  
ley, n. 300.  
p. 1993.



thers of his Works as have gone abroad without his name ; and also the very time when the Author liv'd.

'Tis evident, my Lord, that a Man may judge of some MSS. by the Hand ; and of the Genuine and Spurious Works of some Authors ; and of the time likewise, wherein they liv'd, by the Style of them ; but whether this be so easie a Work, and that the Rules Men generally go by in these cases, are always infallible Guides, is what (I own) I very much doubt of. Suppose, my Lord, for instance, a Man should bring to any Antiquary a good MS. Copy of the *Hebrew Bible*, *Pentateuch*, or *Psalter*, written in a small common Letter, without Points, without fine Knots, and Flourishes, without Pictures, and great Letters, or any thing that should look like Pompous : Suppose that the Ink, Parchment, &c. should carry a seeming face of Antiquity with them, and that a Man should say his MS. was 1000, 1200, or 1300 years old, when as really it was written within a very few Years : Could he from the Hand alone soon find out the Cheat ?

All the *Hebrew* MSS. that I have as yet seen, are written either with *Samaritan* or *Chaldee* Letters. As to the *Samaritan*, I own they bear a good resemblance one to another, and that they differ very much from those *Samaritan* Characters, which we find stamped upon divers truly Antient and Genuine Coins. But then there seems to be such a Resemblance (as to the Character) between those Coins struck in Ages far distant from one another, that 'tis hard (from the Consideration of the Metal, its *Fabrick*, *Weight*, from the Shapes of the Letters in the Inscription, &c.) to say which Coin was made in the time of *David*, or *Solomon*, and which no older than the time of the *Maccabees* ; this being rather to be gathered from the Words and Meanings of their Inscriptions, than from the Figure of the Characters which compose them. The same may be said, in a great measure, of the old *Greek*, *Punic*, *Roman*, *British* and other Coins. The *Chaldee* Character has indeed varied in tract of time, according to the different Fancies and Humours of Men. The *Even plain* Letter, I think, is the most Ancient. This they altered into a more neat way of making it, as your Grace finds in *R. Stephens's Hebrew Bibles*. There is a third fashion, of waving the perpendicular strokes like Rays, as your Grace remembers in some of the *Hebrew Coins* exhibited in the *Prolegomena* to the *Polyglott Bibles*. Then fourthly, there is a large fat Letter in the MS *Rituals* and *Liturgies*, besides the *Rabbinical Letters* of *Italy* and *Germany*, with their Offspring ; the *Littera Coronata*, and perhaps others that I never saw : (not to mention here the *Jewish* Custom of writing the Vulgar Language of the Country wherein they live, with *Hebrew* Letters.) It seems a hard matter, my Lord, to trace the Original and Progress of all these ways of Writing, so, as upon the bare sight of a MS. written in the *Hebrew* Language or Character, to say, by the shape of the Letters of this Book it appears to be so old : and it seems much more difficult to assign the particular Province or Country wherein each *Hebrew* Book was written, as for example, in *Italy*, *France*, *Spain*,



*Spain, Portugal, England, Holland, Germany, Poland, Barbary, Persia, India, in the several Provinces of Turkey, &c.*

The same almost may be said of the *Greek Manuscripts*, in which Language there has been a great diversity of Writing, according to the different humours of the *Scribes*, the Fashion then in use, or the Manner of that particular *Province*, in which such a Book was written. Nor is it easie (tho one would be apt to take such Differences for Land-marks) to tell the Age of a *Greek MS.* without the Date; and I never yet saw such a Date so high as the Year 640, according to the *Greek Computation*. And it is still much harder, from any Remarks about the Character, Illumination, Ink, Parchment, Paper, Binding, &c. to find out what \* Country, Province, or Island, such a *Greek Book* should be written in, or what Country-man the † *Scribe* shou'd be. Nay, and what does farther add to the Difficulty, is, that 'tis known that the shapes of the *Majuscule* Letters found in *Greek MSS.* have been retain'd for above 600 Years together, with little Variation; and also, that some *MSS.* written with *Minuscules* and with Accents, are older than some others which want them. And also, that the present *Greek Copistes* or *Librarii* have three or four different Hands commonly used by them, one being their own *Common Hand*, the others an Imitation of old *MSS.* which are more beautiful, but troublesome in writing, than their ordinary Running Hands: It being customary, as I have been told, when a Man wants a Copy of such a Book to be written, for the *Copiste* to ask in what Hand it must be written (for one Hand, it may be, is more costly than another;) and according as they agree, the Book is written. And thus I have seen some very new Things written in the same Hand with Books which are certainly 400 Years old.

What Methods Learned Men have taken, in order to inform themselves of the different Ages of *MSS.* I know not: but my own has been this; I have been careful to get all the *Dates* I could, wherein 'twas said that such an individual *MS.* was written, at *such a time*, or by *such a particular Person*; every Book with a *Date*, being as a *Standard* whereby to know the Age of those Books of the *same* or a *like* Hand, and of those

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\* If a Man is born in one Country, and writes a Book in another, keeping still to the Character and manner of Writing used in his own Country, I look upon it as the same thing as if he wrote it at home. And therefore I look upon the *Greek MSS.* which *Angelus Borgecius* wrote at *Paris*, as if they were written in *Candy*, where he was Born. And so (amongst many others) to instance in a *Latin MS.* I look upon a Copy of Pope *Gregory's* Pastoral Care, (now remaining in the *Bodleian Library*) as a noble Monument of our *Saxon* Ancestors: Tho *St. Willibald* wrote it, perhaps, at *Mount Cassinum* in *Italy*, and afterward (as it is probable) carried it with him into *Germany*, where it remain'd at *Wurtzburgh*, till that City was plunder'd by the *Swedes* about 70 Years ago.

† Now this may in some measure be done by *Latin MSS.* because there are greater plenty of them. For even I, by exactly observing the nature of the Characters, &c. of those *MSS.* whose Country I was sure of, have afterwards been enabled to say, that this Book looks as if it had been written in *France, Italy, Spain, Germany, the Netherlands, England, Ireland, &c.* and, it may be, about such a time.



that are not very much *older* or *newer*. Where Dates have been wanting in some Books, perhaps they have had some Succession of *Emperors, Kings, Popes, Bishops*, or other *Officers*; and setting down the continuance of their Predecessors for so many Years, Months, and Days, if there be only the naked Name of him who is the last in order, (all other Circumstances concurring,) I then judge the Book to have been written during the Life or Reign of such a Person. Especially if that Succession be afterwards continu'd by a more recent Hand, or that there be two Successions, as of *Kings* and *Bishops*, and the last of each happen to be Contemporaries. Other Observations I have made from *Historical Notes* and *Ecclesiastical Tables*, in some Books. At other times I light upon some *Authentic Charter* or *Original Writing*, in the same Hand with such a Book as I have remembred to have formerly seen, but without any guess at the Age of it. The Age of the *Charter* being known, that of the *Book* is then known also: for I never entertain'd any Notion, or relied upon any Observation, but as I found it confirm'd by the Suffrage of concurring Circumstances, and sufficient Authority. But even in *Dates*, I have found that a Man ought to be very Cautious; for some have been altered by later Hands, for corrupt and base Ends. Some are so worded, as when one thinks that the time they mention, is the time when the MS. was finish'd by the *Copist*, or *Book-writer*; it is meant only as to the time when the Author finish'd his Composition. Other Books are *Post-dated* that they might be accounted New. Of this last kind, is a *Greek MS.* I saw in the University Library at *Cambridge*, which, as appears by a written Annotation therein, was bought such a Year at *Rome*, for so much; and yet the Date pretends that the Book was written at *Rome* in such a Year, which happens to be two Years after it was bought and paid for. The Reason of these *Post-Dates* was, because, before Printing came up, a Book was by how much the Newer, by so much the more Valuable. An *old Book* might be bought for an *old Song*, (as we say) but he that transcribed a fresh Copy must be paid for his pains. And therefore, I have found in some Catalogues of the MSS. formerly extant in our *Abbey-Libraries*, that when they said such a Book was *Liber Vetus*, they would often add, & *inutilis*; but *Liber Novus* was *Nitidus, eleganter scriptus, lectu facilis*, &c. which mean Opinion of the Ancient Copies, by the way, may have been the Occasion of the Loss of many a good Author. The *Librarii* or *Book-writers* were from the time of the *Romans*, a particular Company of Men, and their Business a Trade: But tho *Book-writing* was their Profession, yet they afterwards had but a third part of the Business.

Learning (after the Erection of Monasteries,) was chiefly in the hands of the *Clergy*; who were for the most part *Regulars*, and liv'd in Monasteries. Amongst these were always many industrious Men, who wrote continually new Copies of old Books, for their own use, or for the Monastery, or for both; which seems to have swallowed up above half the Business. Then, if an extraordinary Book was to be written, for the *standing*, and more particular Use of the Church or Monastery, the *Anti-*  
*quarius*.



*quarius* must be sent for, to write it in large Characters, after the old manner, and such a Copy they knew would last for many Ages, without Renovation. Between these two sorts of People, the *Writing-Monks* and *Antiquarii*; the poor *Librarii* or common *Scriptores* (who had Families to maintain) could hardly earn their Bread. This put them upon a quicker way of dispatch, that so they might undersell one another: And in order to this Dispatch, they would imploy several Persons, at one time, in writing the same Book, (each Person, except him who wrote the first Skin, beginning where his Fellow was to leave off:) Or else, they would form the Letters *smaller and leaner*, and make use of more *Figurations* and *Abbreviations* than usually others did. And this, my Lord, is the only account that I can give, for that *Variety* of Hands which in former Ages, being learn'd of, or borrow'd from the *Romans*, was commonly us'd, and in fashion at the same time, and in the same Country, (throughout these Western Parts of *Europe*;) and for their growing less and less for one Age after another. An instance of this may be given from the *Hands* of *England*, which about the Year of our Lord 730 was of three sorts.

I. The *Roman Capitals*, still retain'd, and kept up by the *Antiquarii*, in some Books and Charters.

II. The more *Sett Saxon Letters* (which have a near affinity with the more *Antient Irish Characters*, as being with them derived from the *Roman*;) which were used as the Common Hand of the Age, by the *Monks* in their *Books*; and some *Charters* of their Dictating and Writing.

III. The *Running Saxon Letters*, fuller of *Abbreviations*, and something of kin to the *Longbardic* and *Franco-Gallic*, (both which, with this third sort, were also of *Roman* Original,) and was used by these *Librarii* in their *Books*, and in the *Charters*; as also by some Authors who wrote much, as *Bede*, &c.

There was another sort of *Book-writers* still in use, namely, the *Notarii*; whose business it was to take *Tryals* and *Pleadings* at Courts of Judicature; to write as *Amanuenses* from the Mouth of an Author; and to take *Homilies* and *Sermons* at Church, from the Mouth of the Preacher. These *Notarii* made use of *Notæ* or *Marks* instead of Letters: But when, in Process of Time, Letters were usually written small and quick, and *Abbreviations* grew Common, the *Notarii* were turn'd off, unless they would write Books in *Long-Hand*, as other *Librarii* did, and their *Notæ* grew out of use; and most of their Performances in *Notes* or *Marks* have been since destroy'd.

Suppose then, my Lord, that a Man had one *Latin* Book of each of the four sorts above-mentioned laid before him, written all at a time, and without any *Date* or Note of the Age: Would not he be ready to say that the three first were older than one another? As that that in *Capitals* was older than that in the *Midling* Hand; and this again older than that in the *Running* and *smaller* Hand? and that such a Book written in the *Notæ* being all full of marks, was not *Latin*, but of some other unknown



Language? But to come down later; Suppose that a Person should have some recenter *Books* or *Charters* laid before him in the *Pipe*, *Text*, *Exchequer*, *Chancery*, *Court*, and *Common Hands*, all written at the same time; would not he be apt to say, that one seem'd to be older than another, and that they were the Hands of several Nations?

If it be difficult for an Inquisitive Person to be a perfect Master in all the Successions of Hands, that have been us'd in his own Country, so far as he may be guided by the Monuments therein extant, (and I never heard of any Man that was such a Master) surely, it must be more difficult to pronounce the Age of those Books, *from the Hand*, which were written in other Countries, in an unknown Language. And what may make a Man yet more liable to mistakes (besides the want of Dates in the most Antient *Greek*, *Latin*, and other MSS) was the Practice of many Writers, still to use the very same Hand when in Years, as they learnt when they were Young; like as many Antient People, who do yet continue to write the *Roman* and *Secretary Hands*, which were more fashionable 50 or 60 Years ago, than now.

I will now (with your Grace's leave) touch upon the next Head in your Graces Learned Essay, shewing the great *Easiness* of finding out an Author, and the Time he liv'd in, by his *Style* and *Phrase*.

I wish, my Lord, that it was as easie to discover the *Villanous Authors* of some Treasonable and Scandalous Libels, by their *Style*, as it has been to find out the *Printers*, by the *Paper* and *Letter*. Could this be done, it might not be unuseful to the Government. But People have learnt the knack of changing their Style, upon Occasion, so Artificially, as not to be discovered, but when they themselves are willing to be known. Who would have thought that *Erasmus* wrote the *Epistolæ obscurorum Virorum*? Or that some of the nicer, nay, the most eminent Modern Criticks could have been impos'd upon by their familiar and near Acquaintance, who trump'd upon them their own recent Performances for invaluable fragments of the Antients, whose other Works these very Critics had lying before them? It has been a frequent Practice in all Ages for poor Scriblers to father their wretched Offspring upon Illustrious Persons: and the disparity between the Genuine works of the one, and the Spurious pieces of the other being evident enough, it has been easie to distinguish between the Gold and the Brass. But, my Lord, I would humbly ask this Question, is all that is even now by learned Men ascribed to some Antient Voluminous *Greek* and *Latin* Authors, undoubtedly theirs? May not there still some supposititious Pieces lurk among them, which have the luck to be receiv'd, only because they have been more ingeniously counterfeited? Nay, may not the same Person in the course of his Life, even alter and vary his Style and Phrase unwittingly, and without any design to do so? I think Mr. *Richardson* somewhere in his Answer to *Amyntor*, upon occasion of the difference in point of Style between the *Revelation* of St. *John* and his other Works, between the *Prophecy* of *Jeremiah* and his *Lamentations*, does tell us from Dr. *Cave*, that  
the



the consideration of the Times when a Man writes, or of the Persons to whom, or the Subjects about which, or the Temper of Body, or the Humour he is in when he Writes, or the Care and Pains that he takes in Writing, may Occasion such Alterations in his Style, as that no certain Rule can be inferr'd from thence. And if my Lord, it was really possible to find out the Time when an Author liv'd, only by diligent Reading his Works, surely the World wou'd have been long since agreed as to the Time when *Homer* lived, though they could not tell where he was born. And I believe even in the List of *Ecclesiastical Writers* there are some, and those not of the least consideration, who (notwithstanding their Works have been read over and over) are still reckon'd to be of uncertain Age.

As for *Pictures*, though I have much less Experience in them, than I had once in MSS. yet I will not deny but that the Works of an hundred Masters (besides those your Grace has been pleas'd to mention) may be known by the Hands, tho they may be almost as different as their several Hands in Writing: But that one Painter can't Copy from another so exactly, as that in tract of time it shall not be known which Picture is the Original, is what I dare not assert. It has been frequently practis'd by Painters to borrow Pictures of those who are Lovers and Judges of such things, to Copy them, and to return their Copies for the Originals, without any discovery made by the discerning Owners. And I believe it possible (tho exceeding difficult) for a great Master to Copy a Picture so, that when they both stand together, a good Judge shall not dare positively to say which is the Copy, and which not: Nor he that drew the Original, dare to own, that he could imitate his own Handy-work better than a Stranger has done. There are a great many Stories common among Painters, to this purpose. And one wou'd not think it much more difficult, for a Man to imitate a Drawing or Picture, than to counterfeit another Man's Hand-writing, which some People can do most exactly. And others with Pen and Ink, will Copy after any thing, that is Printed so nicely, as that one would affirm their Writing to be printed off at the Press.

Your Grace's Notion of discerning the *Age*, as well as the *Hand* of the Painter, by his Picture, is very curious, and altogether new to me: And I doubt not but there is a great deal in it. I only want the whole Works of some great Painter, with an account of the time when he wrought each Piece, to fit me for the making the Experiment. And why might not this Notion be advanc'd a little further, and the Painter's Complexion be known by his Pictures, as well as his Age? as supposing that the *Sanguine* do naturally run upon *Pourtraits*, *Poetical Histories*, *Nudities*, &c. The *Cholerick* upon *Battle-pieces*, *Sea-fights*, *Fire-pieces by Land or Sea*, *Tempests*, &c. The *Phlegmatick* upon the *Still-life*, *Flower-pieces*, *Birds*, *Beasts*, *Fishes*, &c. and the *Melancholic* upon *Landskips*, *Architecture*, *Pieces of Perspective*, &c. Not but that the different Genius of a Country,



Country, or the Desires of a good Customer, may oblige a Painter to work upon a subject, which he had no great Fancy for. As to the difference in the works of Painters grown old, in respect of what they did when young, I doubt no certain Rules can be establish'd as to their Performances in that kind. I know, my Lord, that Painters do generally live faster than other Men, which may at length occasion a failure in their Sight and Memory, a trepidation in their Hands, &c. And yet I never heard that *Michael Angelo*, *Alb. Durer*, *Titian*, and others, painted worse at the latter end of their long lives, than they did before. Nay, I hear that *Signior Verrio*, tho' grown old, paints now far better than ever, and is grown almost ashamed of some of his own Works which he painted at *Windsor Castle* in the time of K. *Charles II.* There may be this in it, that aged Persons having attain'd, thro' long Practice, to a greater Experience, to a more Solid and Mature Judgment than they had when younger, are more cautious of that which they let go out of their Hands; and correct those flashy touches of their Pencil, and other superfluous Irregularities, which they and others were formerly very fond of.

As for the *Flame and motion of the Eyes* in a Picture, or the *Breath in the Mouth*, I can say but little, having as yet never had the happiness to see such Rarities, tho' I have been admitted to the sight of some of the best Pieces of the most celebrated Masters. As to the Painters Painting a Living or Moving thing, so that one shall almost discern the Motion, and see the *Bird Flying*, the *Horse or Hound Running*, &c. that is more easie, especially when assisted with the friendly and pregnant Fancy of the charm'd Spectator. In the *Still-life* indeed, the Eye is quickly deceiv'd, and tho' there are, I believe, several Masters now living more excellent at it than ever *Zeuxis* and *Parrhasius* were; yet still with all their Art, 'tis very difficult to impose upon a Man so, as to make him believe 'tis not a *Picture*, but the very *Life* that he sees before him.

*Musicians* seem to be under the same Predicament with *Painters*, since they are observ'd to live *Fast*; as also the *Poets*. 'Tis by the Practice of many Years that they attain to a just Knowledge and Mastery in their respective Arts; and as their first Compositions are little and light, suitable to the Mercurial temper of heedless and inconstant Youth; So, in time, this wears off, and as their Experience and Judgment encreases, their Compositions grow more solid and sound. A young Man may make a better *Minnet* or *Jigg*, but the Elder a more sound *Service* or *Anthem*. The Music of the former (with other Accomplishments) may go a great way towards the enticing a foolish Girl to Love; but that of the latter excites the Devotion, moves the Affections, and raises the Passions of those truly Religious Souls, who take pleasure in singing Praises to the Honour and Glory of his Name, who lives for ever and ever.

If your Grace shall say, that the very best *Painters*, *Musicians* and *Poets* died young, or at least before they attain'd to an advanc'd Age, when they would



would have fail'd or grown dull, as others did: I must beg leave to say that old Men are of two sorts, either those who are much affected with their Age and weakness, or those who are not.

If a Man be born of unsound Parents, or hath liv'd all along in an Air disagreeable to his Constitution, or has his Constitution always unhealthful, or has liv'd an intemperate or debauch'd Life, or has been crush'd by any heavy Misfortunes, or always liv'd in Poverty or Discontent; 'tis no wonder, if in spite of all this, he attains to old Age: but then he will probably lose the clearness of his Head, the fix'd attention of his Mind, the brightness of his Parts, which he might be formerly noted for. If a Man has never had any of these disadvantages to wrestle with, but has all along been blest with the contrary: then, he being bred up to a Profession, and always following it, his Judgment therein still encreases, and his Hand (one would think) should be more nimble and ready, and the Man a better *Painter*, *Musician* or *Orator* than ever: And why not a better *Poet* too? I say, with submission, my Lord, if Mr. *Dryden* (tho he was said to be unhealthy at last) wou'd have taken as much pains, or had been allowed time to his Mind for revising his later Poems, as in some of his former, they might have been as well, if not better accepted. I don't see that 'tis old Age that does a Man this diskindness, but rather, that 'tis the Accidents that do often attend it, which yet many are freed from to the very last. Suppose then, my Lord, if *Raphael* or *Vandyke*, or the late Mr. *H. Purcell*, or *Alessandro Stradella*, should have continued their Practice of Painting and Music till they grew old, from the Accidents attending which, suppose them (as a great many other People) to be very free; might we not then have justly expected from them even greater Wonders than they had ever before perform'd? I won't say that an old General is fitter to be trusted than a young one; or that the late *Mareschal Scomberg* at his Death, was a better Soldier (notwithstanding his Age) than the present Kings of *Sweden* and *Poland*: But rather, that the Study of *Divinity*, or of the *Laws*, do seem as nice and large as those of *Painting* and *Music*. Now the old and sage Men of those Professions are every where most regarded; they are found to have the ripest Judgments, and they are deservedly employed in the most weighty Affairs appertaining to their Professions. And it has been seen (as was partly said before) that some *Painters* and *Musicians* have not at all fail'd as they grew old, but kept that great Reputation to the last, which they had before acquir'd. My Lord, upon the whole, it seems to me (tho I know my Opinion is of no weight) that there is a gradual and sensible alteration in the appearance of things, and especially in the Scripture or Hand-writing of MSS. Now these ought to be consider'd with respect to the particular places wherein they were written.

Every Country is supposed to have remaining in it the greatest Variety and most considerable Monuments of its own Characters; unless they are known to be carried away to other places. And therefore, if any Man



be desirous of considering the Letters of any Language that has been confin'd to any one particular Region or Province; 'tis but going thither, and it's ten to one, but (if he be diligent) he may satisfy his Curiosity very well. For Example, suppose I should be willing to consider the nature of the *Irish Letters*, their Original, Progress and Variations, with their Relation to the *Roman, Franco & Anglo-Saxon*: this might be done by travelling *Ireland* principally, by taking a trip into the *Scotch Highlands*, and perhaps into the *Isle of Man*, and by consulting some *English* and other Libraries, whither some *Irish MSS* have been carried. If I would consider the *French, Italian, Spanish, and English Hands*, each Country affords sufficient helps. But if a Man would consider the Letters of a dead or living Language, which spread far, and has been, or is us'd in several Countries: he can't be suppos'd a perfect Master in all the ways of writing that Language, till he has consider'd the whole State and Succession of its Letters in each of those Countries: Amongst those Languages I reckon the *Hebrew, Arabic, Turkish, Armenian, Persian, Greek, Latin, Teutonic, Sclavonian, &c.* And tho' *Latin* is common amongst us, and every body is pronouncing the Age of a *Latin MS.* yet I think they would do well to enquire where as well as when a Book was written. And if they are certain that such a *Latin Book* was written in such a particular Country, or Province, 'tis then more easie, by considering the Succession of Letters us'd in that Province, or by comparing it with other Books written therein, to say how old it is. For want of this consideration many Learned Persons have been almost always out in their Calculations, and have pronounc'd at Random. If then, my Lord, this Method appears Rational, and even Necessary, in order to attain a sufficient Measure of this sort of Knowledge; it follows, that 'tis no easie matter to assign the Age even of a *Latin MS.* no, not even in *England*, where yet I suppose there may be as great a variety of *Latin Hands*, as in most other Countries.

As for *Painting and Music*, they are Arts that I have always had a great Love and Affection for. I know very well that each Painters Hand and each Musicians Manner differs from another; but whether there is a gradual and remarkable Variation from themselves in the Course of their Lives, is what I never heard asserted. This is certain, that they change their way of Painting and Composing at pleasure; and therefore, Mr. *H. Purcell's Dulcibella* is said not to be like his other Music; and Mr. *Fuller* the Painter could put one of his Pieces upon Sir *Peter Lely* for a most incomparable Picture of *Mich. Angelo*. But then these Changes and Variations from their usual Manners are very seldom made. And a Man generally pursues and practices that which is most agreeable to his own Genius. For this Reason, when a Painters Hand is fixed, his Manner is then limited; and so when a curious Person comes into a Gallery, he knows that this Picture was done by *Ryley, Kneller, Vandyke, Dobson, Tintoret, &c.* and that to be a Copy after *Reubens, Georgeon, Salv. Rosa, Han. Caraccio, Pietro di Cortona, &c.* When he comes



comes to an *Opera*, to a *Consort*, or to *Church*, not knowing before-hand what Music is to be perform'd, yet he may soon discern that it was compos'd by *Corelli*, *Baptist*, *Bassani*, *Charissimi*, *Blow*, *Purcell*, &c. And so upon Reading an Antient Author, a sagacious and learned Person may find, that he writes according to the manner of such an Age, that the Style imitates such another, or that the Book, tho' it bears such a Man's Name, yet might, perhaps, be more truly ascribed to another, with whose Style it more exactly agrees: As for Example, that Piece of *S. Cyril's*, publish'd from the *Escorial* MS. by *Barthasar Corderius*, is thought (by reason of the Analogy in point of Style) to be *Origen's*: But then, whether all this can be always done, done easily and without *Errors*, is the doubt. And it seems yet a greater difficulty, certainly to discover how old the *Painter*, *Musician*, *Poet*, *Orator*, or other *Author* was, when he finish'd any one piece of his Works, unless a Man is plainly told so: This being a sort of Knowledge, that those who have been otherwise sufficiently experienc'd in their several Arts and Professions, have not as yet pretended to.

II. 1. Rightly to understand the Rule in our Common Prayer Books for finding *Easter*. Note, The Rule for finding Easter explain'd, by Mr. Thornton, n. 297. p. 1902.

That *March 21.* in all but Leap-Years, and in Leap-Years *March 20.* was at the time of the Council of *Nice*, when this Rule was made, the Vernal Equinox. Consequently,

*March 20.* in Leap-Years is the same as *March 21.* in common Years.

The Full Moon meant in this Rule, is not to be found in our Almanacks, but by the Calendar of our Common-Prayer Books, where in the first Column the Golden Number of every Year is placed over against the Day of the New Moon in every Month of the Year.

The 14<sup>th</sup> Day, including the first Day of the Moon, is the Full Moon, and not the 15<sup>th</sup>.

2. The Rule is thus worded, viz.

Easter-day is always the first Sunday after the first full Moon, which happens next after the one and twentieth day of March. And if the full Moon happens upon a Sunday, Easter-day is the Sunday after. --by Mr. Jack. man, n. 303. p. 1123.

For the right understanding of which it is sufficient to observe,

1. That the full Moon meant is the 14<sup>th</sup> Day of the Moon, according to the Calendar in the *Common-Prayer-Book* (which may be called the Church-Calendar) counting that Day of the Month for the first of the Moon, which hath the Golden Number of the Year collateral to it in the first Column of the said Calendar. And

2. That these words [next after *March 21.*] are meant inclusively, as if it had been said [next after the commencement of *March 21.*] so that if the Full Moon happens on *March 21.* the same must be the Paschal Full Moon.



These Observations are necessary and sufficient to reconcile the Rule with the authentick Table to find *Easter* (from which Practice never varies) and then they are right and sufficient.

1. I prove the first Observation necessary to that end: Because, if the Paschal Full Moon be any Day, before or after the 14<sup>th</sup> of the Moon by the Church-Calendar, then the Rule and the Table will clash. For 1. If it be any Day before, then as often as the said 14<sup>th</sup> of the Paschal Moon is a *Sunday*, that very Day, at latest, must be *Easter-day* by the Rule, as being a *Sunday* after the full Moon therein meant: Whereas by the Table and Practice it is not till the *Sunday* after that. Thus *Sunday April 1.* this Year (1705.) was the 14<sup>th</sup> day of the Moon by the Church Calendar, and therefore must have been *Easter-day* (or after) by the Rule, if the full Moon therein meant had been any Day before the said 14<sup>th</sup> of the Moon, whereas *Easter-day* was *April 8.* by the Table, and accordingly observ'd. And this obliges us not to understand the true full Moon by the full Moon in the Rule, because that happens about four Days before the 14<sup>th</sup> of the Moon by the Church-Calendar. 2. If the full Moon meant in the Rule be any Day after the 14<sup>th</sup> of the Paschal Moon by the Church-Calendar, then as often as the said 14<sup>th</sup> happens to be *Saturday*, and consequently the full Moon meant in the Rule to be the *Sunday* following at soonest (that being the very next Day) that *Sunday* cannot be *Easter-day* by the Rule; whereas by the Table and Practice it is. Thus *Saturday, April 4.* 1702. was the 14<sup>th</sup> day of the Moon by the Church-Calendar; and therefore if the full Moon meant in the Rule were any Day after that, it must have been on *Sunday April 5.* at soonest; consequently *April 12* at soonest must have been *Easter-day* by the Rule; whereas *April 5.* was *Easter-day* by the Table and Practice: And this evinces the mistake of those, who make the 15<sup>th</sup> day of the Moon to be the Full in the sense of the Rule; as Dr.\* Wallis, Mr. Wright, in his *Postscript* to his *Short View of Mr. Whiston's Chronology, &c.* and the *Introductio ad Chronologiam* (Reprinted at Oxford, A. D. 1704.) p. 37.

\* N. 240, Abr.  
Vol. III.  
p. 402.

2. I prove the second Observation necessary to the same end; because a full Moon in the sense of the Rule, (*viz.* the 14<sup>th</sup> day of a Moon by the Church-Calendar) often happens on *March 21.* and in that case the *Sunday* following is always *Easter-day* by the Table and Practice; whereas it must be a Month after by the Rule, unless we understand these words, [next after *March 21.*] as I explain them. And this will be the case next Year (1706.) nor doth the proof of this point need the supposition of the foregoing, (tho' that may now be fairly supposed, as being already prov'd) for, count you the full Moon how you will, *March 22.* can never be *Easter-day* by the Rule, unless *March 21.* may be the Paschal full Moon by the same; and yet *March 22.* is *Easter-day* by the Table and Practice, as often as the Golden Number is 16, and the Dominical Letter D.

I am aware that this 2d Observation may seem to many forc'd and unnatural; and that, perhaps might induce some to count the 15<sup>th</sup> Day of



of the Moon for the full in the Rule, and Mr. *Thornton*, to substitute *March 20.* in Leap-years for *March 21.* neither of which *Hypotheses*, however, do any Service, all things consider'd. The former indeed would vacate my second Observation, (*March 21.* never being the 15th day of the Moon by the Church-Kalendar) but then it would make the Rule notoriously irreconcilable with the Table and Practice, as hath been already seen. And, as to Mr. *Thornton's Hypothesis*, 1. The only Colour for it (*viz.* That at the time of the Council of *Nice* the *Vernal-Equinox* was *March 26.* in Leap-years, and not *March 21.* as in common years) is, for any thing that I know, more likely to be false than true, and doth by no means follow from the Intercalation. 2. If this Colour were true, it were too great a Nicety to have been probably regarded by the Church. 3. This *Hypothesis* puts more force upon the words of the Rule than mine. And lastly, If it were admitted, it would solve the Difficulty only in Leap-years, and my second Observation would still remain necessary, because the Case happens as well in Common as in Leap-years, whereof we have an Example in the Year (1706.) Nor will my second Observation be much boggled at by those that know and consider the inclusive way of reckoning used by the *Romans*, and from them deriv'd to all the *Latin Churches*, and particularly that of *England*; for 'tis as proper to say [next after *March 21.*] with the meaning I contend for, as to say, *Tertio (ante) Calendas, Nonas vel Idus* in the sense of the *Roman Kalendar*; or, as to say (as our Church doth a little after this Rule for *Easter*) that *Ascension-day* is forty days after *Easter*, intending *Easter-day* itself to be one of those forty. And 'tis observable in this very Rule, that, after it had been said, that *Easter-day* is always the first *Sunday* after the full Moon, &c. 'tis added, That if the full Moon happens on a *Sunday*, *Easter-day* is the *Sunday* after; which had been a gross Tautology, if by the first *Sunday* after the full Moon might not be understood the day of the full Moon itself, when happening to be *Sunday*. And if the *Sunday* of the full Moon may be signified by the first *Sunday* after the full Moon, then the full Moon of *March 21.* may be signified by the full Moon next after *March 21.* 3. I prove that my two Observations are sufficient to reconcile the Rule and the Table; because I my self have drawn up a Table to find *Easter* for ever, by the Rule understood according to those Observations, and in the plain and obvious Sense in all other Respects; and upon comparing, have found it to agree in every particular with the Table for the same purpose in the Common-Prayer-Book; and any body else may make the same Tryal; which Method, if others had taken to examine their Explications of the Rule by, they must have discovered their Mistakes.

III. After all the extraordinary Recommendations the Criticks have been pleas'd to bestow upon the 3d Ode of the 4th Book of *Horace*; yet one of the most beautiful Passages, and surprizing Fancies of the Ode, seems

Of the ancient  
Greek and  
Roman Lyre,  
by Dr. Tho.  
Molyneux,  
n. 282. p. 1267.



seems to me to have been so overlookt by them, that neither they nor any of the Commentators, I have hitherto had an Opportunity to consult, and I have examined the most chief of them, as *Lambin*, *Minellius*, *Bond*, *Despres*, *Dacier*, &c. have fully comprehended the meaning of the Poet, or the whole scope of his Sense, which he expresses in these Words,

*O Testudinis aureæ  
Dulcem quæ strepitum, Pieri, temperas !  
O mutis quoque Piscibus  
Donatura Cygni si libeat sonum !*

I must freely own, when first I reflected on these Lines, and observed *Horace's* great Heat and Vehemency, in his repeated Exclamation, upon admiring his Muse's Power, because she could give when she pleas'd even to *Mute Fishes*, the melodious Voice of the Swan, I was not a little shockt and confounded, for I lookt upon the Fancy as perfectly forced and groundless.

So I put my self to consider a little, whether upon second Thoughts, I could not discover what might be the true Intention of the Poet in these Lines, and after perusing them a while, what was before dark and obscure, appeared so plain and evident, that I was immediately convinced in my self, he could not possibly have any other Meaning than this.

After he had in the Verses going before, acknowledged how much he was owing to the Bounty of his Muse, here he makes a sudden Exclamation to extol her great Art and Mastery, who by mixing various Notes, could compose such sweet Harmony upon the *Gilded Lyre* or *Testudo*, and by her surprizing Power could when she pleased, give even to mute Fishes, or the hollow Shells of the *Testudines Aquaticæ* or *Water Tortoises*, a sort of Fish, of which I imagined they made their Lyres in old Times, the sweet Melody of the Swan. As for the Comparison he makes to the Voice of a dying Swan; tho' this were granted an Error, yet I thought it such a one, as might pass very well, since it serves here only as an Allusion, and might be used for that end, because it was certainly a received vulgar Opinion in *Horace's* Days, as it prevails still in ours; and therefore might properly enough, tho' a Fiction, illustrate this mighty Attribute he in such positive Terms, and in so surprizing a manner ascribes here to his *Muse*: for even a *Vulgar Error* universally imbraced, was ever Authority sufficient for either a Poet or an Orator to draw from it a Comparison or a Simile.

*Monsieur Dacier* I confess, has nothing that in the least favours the foregoing Explanation; but on the contrary in his Gloss upon these words in the same Ode.

*Totum Muneris hoc tui est, &c.*

Says, *Horace* could not have given a more ample Testimony of his Modesty, than he has shewn in this Expression, which ascribes all the Merit



Merit he had wholly to the Gift of his Muse, who might, says he, if she so pleased, have made even a mute Fish speak; which intimates, 'twas a thing he imagined she had never done; tho' according to my Sentiments, the Harmony of every speaking Lyre, was then no less than the Voice of a dumb Fish, raised by the power of the Muse in the Allegorick manner of speaking they affected in those Days, which now we should say was done by the Skill of the Musician.

Upon Enquiry whether the *Testudo* or *Lyre* of the Ancients, was made of the back or hollow Shell of the *Tortoise*, as the name seem'd fully to import; it appeared from several Hands, 'twas a current piece of History, generally receiv'd among the Ancients, that *Mercury* was the first Inventor of the *Lyre*, (whence *Horace* Lib. I. Ode 10. styles him *Curvæ Lyræ Parentem*) and that he made it of the Shell of a dead *Tortoise*, he accidentally found on the Banks of the River *Nile*.

The first Testimony I shall take from an old Physician, a *Greek* Poet, that writ above a hundred Years before *Horace*, I mean *Nicander* in his Poem he calls *Alexipharmaca*, where speaking of the Antidotes proper against the Poison of the *Salamander*; he recommends both the *Sea* and the *Mountain Tortoise* in these Words.

Ἀμμιγδὴν ἀλίοιο καὶ τεφνέοντα χελώνης  
 τυίοις, ἢ ταχυνῆσι διαπλώει πτερύγεσσιν  
 Ἄλλοτε δ' ἑρέης κωτισηνόμῃ ἢν τ' ἀγκύηται  
 Ἀυδήεσαν ἔθηκεν ἀνάυδητον περ' εἴσαν  
 Ἑρμείης, ζαρκὺς γὰρ ἀπονόσφισε χελείον  
 Αἰόλον, ἀγκώνας δὲ δύω παρετείνατο πέζαις.

Which I find thus translated by *Johannes Gorreus* a *Parisian* Professor of Medicine of the last age.

Cum curva auxilio veniunt Testudine.---  
 Quæ Pelagi fluctus velocibus innatat alis,  
 Aut montana etiam Cytiso quæ voscitur & quam  
 Reddidit e muta modulanti voce canoram  
 Mercurius, picto insontis qui Cortice carnem  
 Exemit, geminumq; Ancona intendit in oris.

*Jacobus Grevinus*\* gives us an ample Comment on these Verses, and relates at large the History of the first *Lyre*; which I refer the Reader to, rather than transcribe it here; but this I cannot but take notice of (by way of Supplement to what he says) this Verse ---

Ἀυδήεσαν ἔθηκεν ἀνάυδητον περ' εἴσαν;  
 Reddidit e muta Modulanti voce canoram.

--- Is so home and apposite to our present purpose, and comes up so close to *Horace's* Thought.



*O mutis quoque Piscibus  
Donatura Cygni si libeat sonum.*

That it does not only explain the true meaning of it, but makes me inclinable to believe the *Roman* might have in his view this very passage of the *Greek* Poet when he writ these Lines; for whoever is moderately conversant in the *Greek* and *Latin*, will easily be of opinion, that the latter frequently borrow'd not only their thoughts and fancies from the former, but even sometimes they copied as near as possible, their very turns and expressions, considering they writ in a differing Language; yet this must be allow'd, they usually surpass'd those they drew from, and the Copies went beyond their first Originals, as *Horace* I think has here outdone *Nicander* in his fancy, which I perceive he has been so fond of, that he was not only satisfied to use it in this place, but has it again, tho not so expressly, where he invokes his Lyre in this manner.

*Tuque Testudo resonare septem  
Calida nervis  
Neque Loquax olim neque grata---*

Which last Line is a plain comment to shew what he means in this place.

*O mutis quoque piscibus, &c.*

The other instance I shall mention, is from one of *Lucian's* Dialogues, who writ above a hundred Years after *Horace*, whence 'tis plain the Mechanism of the antient Lyre, and the Opinion concerning its first invention, prevail'd since, as well as before *Horace's* Days. In this Dialogue he introduces *Apollo* and *Vulcan* talking after his jocular way of *Mercury* to this purpose.

Απ. χελώνην πρ νεκράν εὐρών, ὄργανον ἀπ αὐτῆς συνεπήξατο, πήχας ὃ ἐιάρμοσας, & ζυγώσας, ἔπειτα χαλάμεις ἐμπήξας, & μαγάδιον ὑποθεῖς, κατὰ ἐντεινάμενος ἐπὶ τὰ χόρδας, μελοδεῖ πᾶν γλαφυρὸν ὦ Ἥφαίστε & ἐναρμόνιον.

Ap. Testudinem mortuam alicubi offendens Instrumentum ex ea concinnavit; Brachia enim adaptans Fugum opposuit, deinde Clavos infigens, & Hæmisphærium repandum infra subjiciens, septem Cordas extendebat, atque modulabatur quiddam valde sonorum, O Vulcane, & ad Musicæ Melodiam compositum.

\* Lib. I. de Instrum. p. 7. I borrowed the first of the following Figures from that excellent Treatise of the Harmonicks of the learned Father \* *Marinus Mersennus*.



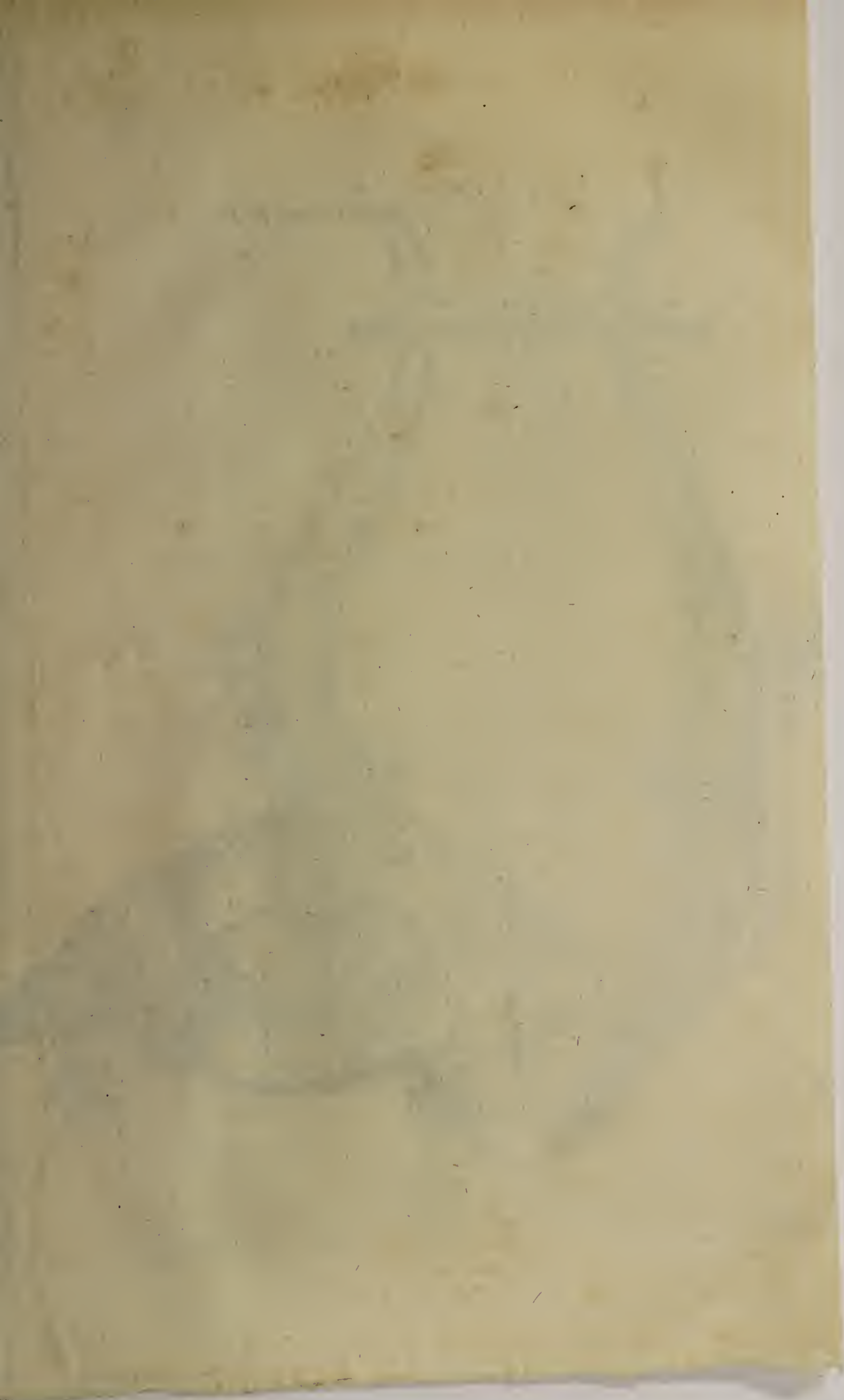




Fig: 1.

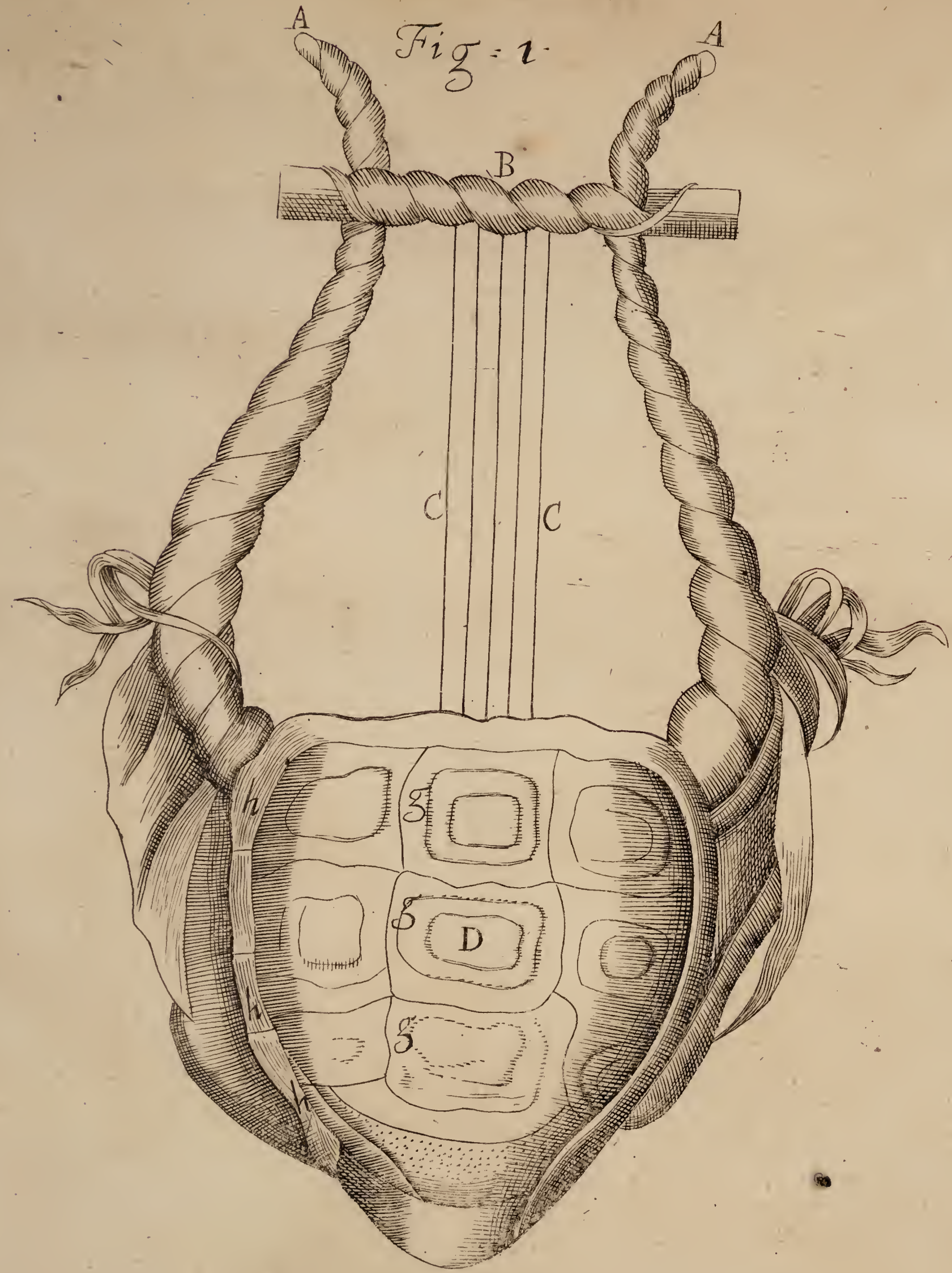


Fig: 2.

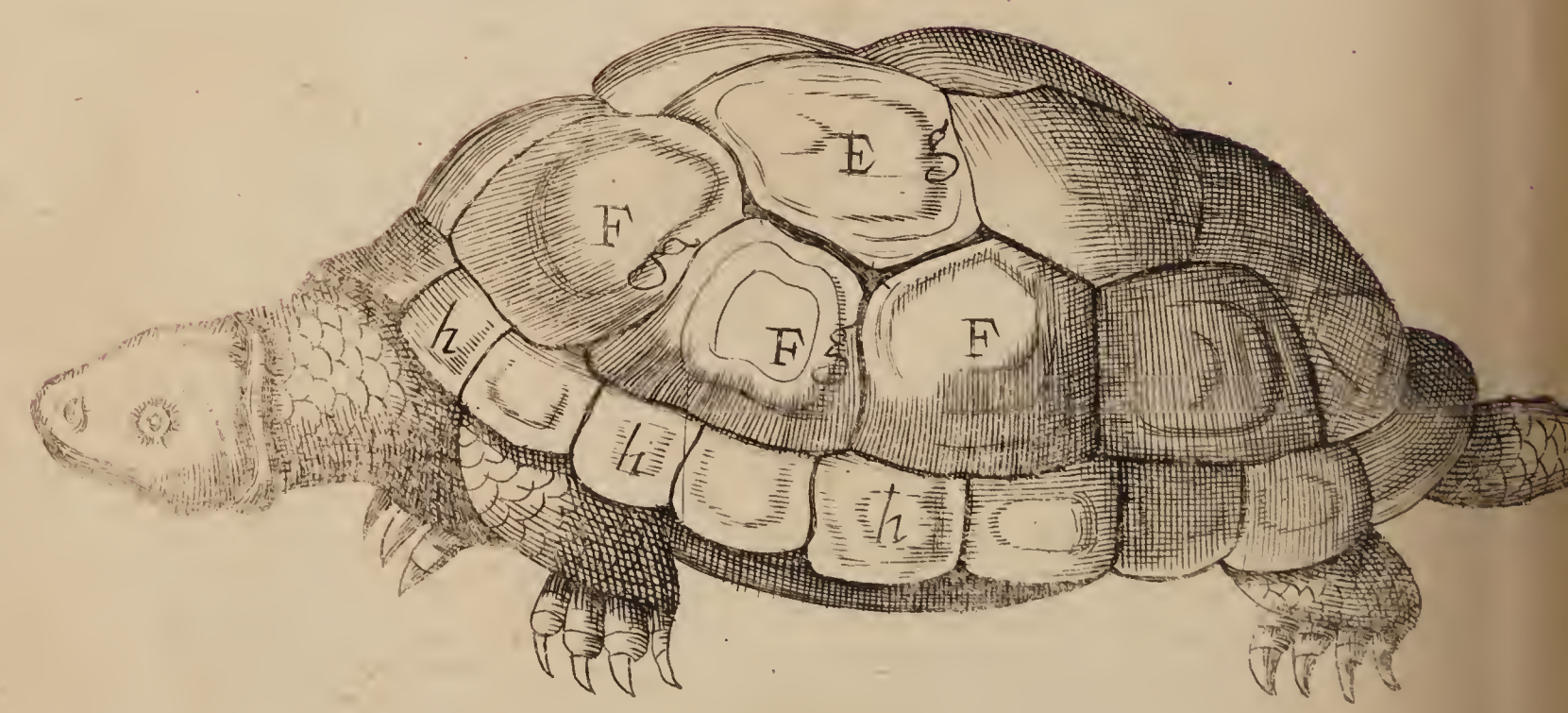




Figure the first represents the ancient *Lyra* or *Testudo*, and the Father tells us he copied this Figure (which I have exprest in somewhat a larger size, that it might the better agree with the proportion of the annex Scheme) from the Sculpture of an Antique Gemme that belong'd to one *Jacobus Gaffarellus*. *A A* shew the *πήχεις* of *Lucian* the *Ἀγκῶνες* or *Brachia* of *Nicander*, made of the Horns of some Beast. *B* the *Ζύγος* or *Fugum*, in which were fastened the *κάλαμοι* *Clavi* Pegs that raised or depressed, *cc* the *χορδαί* or Strings, which were fixt at their t'other end to *D* the *μαγάδιον* *Hemispherium* or Belly. Of the Lyre of this part of the Instrument the good Father not having, I suppose, well consider'd, or thoroughly inquired into the matter, says, that it seem'd *Testudinis Dorsum Ventrem seu Testam representare*; where 'tis plain 'twas more than a resemblance, and was really designed to exprest the thing itself; as appears by the second Figure of an intire *Testudo Aquatica* or rather *Fluviatilis*, as *Cicero* calls it (in his *Natura Deorum*) taken from *Johnstonus de Animalibus* as delineated in his eightieth Table *de Quadrupedibus*. Whoever compares these two Figures, tho but little conversant in the natural History of Animals, and will but make allowances for their different posture, one being represented full and in a flat posture, whilst only half of the t'other appears, because 'tis shewn side ways, will soon be convinc'd of this truth.

For if we observe how the Belly of *Mersennus* his antient Lyre markt *D*. agrees nicely in Figure and Shape with the Back or Shell of *Johnstonus* his *Testudo Aquatica*, markt *E*, how they are both curiously tessellated and checker'd into Areas or Scales *F. F. F. F. F. F.* of somewhat a square Figure, and each of these Scales again in both so neatly wrought about their edges with a line running parallel to their Margins *g. g. g. g. g. g.* and how the Shell of the Lyre, as that of the Tortoise, terminates in a narrow Limb or Verge, cut into smaller Scales *b. b. b. b. b. b.* incompassing the whole; whoever I say, remarks this accurate agreement of the two Figures in all these particulars, must at the first view be satisfied they were taken from the same object, and tho' drawn by different Artists, may be at two thousand Years distance, yet both manifestly own the lineaments of the same natural Original.

This too fully appears from a passage in *Pausanias* his description of *Greece*, as I find it quoted by *Gesner* (for I have not the Author himself by me) which mentions a Mountain in *Arcadia*, called *Parthenius Mons*, *qui Testudines exhibet ad compingendas Lyras aptissimas*; and the same Author again says in another place, *Arcadum Querceta ingenti magnitudine Testudines exhibent, ex quibus Lyras conficeres aequales illis quæ ex Indica Testudine componuntur*. From whence 'tis plain the Antients made their Lyras of the Shells of Tortoises; and we may likewise conclude from hence, that in the beginning of times, e're the skill of Musick, or the art of making its Instruments arrived to any perfection, the greatest Masters in both ways were not over-nice and curious in the choice of their mate-



materials, but promiscuously the *Land* or *River Tortoise* to make their Instruments of, as this or that came more opportunely in their way, which occasions *Pausanias* and *Nicander* to mention the *Mountain*, whereas *Horace* speaks of the *River Tortoise*; of which therefore we may suppose his *Lyre* was made. And indeed, if we consider the true rise or way of Invention of all sorts of Tools, Weapons, Machines and Instruments that now prevail in the World (especially those of Musick, which are what we are now discoursing of) from their first Beginnings, we shall find they constantly derived their Origine, and borrowed their first materials from somewhat that was natural, rude, plain, simple and easy to come at. Thus all the variety of curious Pipes now in use, as the *Flute*, *Flagelet*, *Hautboy* and *Organs* themselves, tho' so artificially contrived, and exquisitely wrought, certainly owe their Beginnings to, and are only refined improvements of the *Tenuis Avenæ* or *Oaten Pipes* of the Field, or the *Calami impares Juncti* of the Antients, *Reeds* of unequal lengths rudely put together; and thus we see the Trumpets of old were at first made only of rude *Horns*, the easy spoils of Beasts, and sometimes of the common *Buccina Whelks* or large Sea Shells that were obvious, and readily found on every Rock or Sea Shore.

And afterwards when the *Roman* People enlarged their Empire, grew more polite, and all their Mechanick Arts received mighty improvements, tho' they had then learnt to make these same Instruments of different and more commodious shapes, and framed them of quite other sorts of materials, yet still they retained their first old Names, and so the *Testudo* did, by which we might as easily trace it as these to their primitive originals.

For 'tis very manifest, that in succeeding Ages, as the skill of the Mechanick Artist, that wrought and contrived the *Lyre*, as well as that of the Musician that used the Instrument, arrived at a greater height, the Model of the old *Testudo* was much alter'd, the number of the Strings increased, and the shape so mightily diversifyed, that at length they wholly laid aside the *Tortoise-shell*, and the sonorous part or Belly of the *Lyre*, was made of such different Figures, that they bore not the least resemblance to its first Model. This plainly appears from those other Schemes *Mersennus* gives us in the same Table of several sorts of the antient Lyres (but these I take to be more modern than that which is here expressed) and from those described by *Leonardo Agostini*, in the second part of his Collection of the *Gemme Antiche*, which shews us, that as the fancy of the Workman, Model of the times, real Convenience, or an imaginary Beauty in the Instrument determined it, they were fashioned into various shapes, and frequently like their *Lamps* of old into capricious fantastical odd Figures.

Of the Roman  
Legions, by Dr.  
Musgrave,  
v. 33.7. p. 80.  
(1) Vairo de  
lib. 4.

III. LEGIO res, ut Romana vox est, a legendo milites in delectu  
(1) sumpta. Legionum ante Augustum Cæsarem, alius omnino status &  
conditio fuit, atque post illum Imperatorem: five earum Numerum five  
mili-



militum in earum singulis contentorum (de his duobus verba præcipue facturus sum) animo contemplemur.

ANTE Augustum illæ Ducum erant notæ in gerenda repub. eximie virorum, & ab iis, a quibus seu dilectæ, five rectæ fuerunt, aliquando Nomina cepere. Legiones a Valerio Flacco conscriptæ, ab eo dictæ sunt (2) Valerianæ; sed cum iisdem imperitavit Fimbria, dictæ sunt ab eo (3) Fimbriane.

MILITUM in Legione numerus stante Repub. dubius, alias major, alias minor fuit; sed qui, maxima ex parte, gradatim auctus: Ita vero, ut plerumque minor quam sub Imperatoribus inveniretur. Romuli prima Legio Peditum tria millia, secundum Varronem, est complexa, [Milites (4), ait, quod trium millium primo Legio fiebat.] Plutarchus (5) hisce trecentos Equites adjecit. Postea pro usu Reipub. & Senatus arbitrio, ad quatuor (6) millia, ad quingentos (7) supra quatuor millia, ad quina (8) millia & ducentos Pedites, ad sena Peditum millia, & Equites trecentos, accrevit. Id autem, quod diligenter observandum, non ex Romanorum more usitato, & communi usu, vel lege aliqua, sed vel ex periculo quodam imminente, (ut in Bellis Punico (9), Macedonico (10), Mithridatico (11), ) vel Imperatoris (uti Marii, in Bello (12) Jugurthino; Antonii, in Bello (13) Civili) auctoritate, non ex Senatus decreto factum esse liquet.

HIS, de militum in Legione numero, sub Regibus & Reipub. initio dictis, adversari censentur ea, quæ ex Plutarcho & Eutropio citantur. A Plutarcho (14) scriptum est, Διπλασιασείσης ἡ τῆς πόλεως, ἐκάλον μὲν ἐκ Σαβίνων πατρίκιοι προσκαλειλέχθησαν, αἱ δὲ λεγεῶνες ἐγένοντο, πεζῶν μὲν ἑξακισχίλιων, ἵππέων δὲ ἑξακοσίων. Id est, Civitate jam in duplam aucta, Sabinis ea donatis, ex iis alios centum Patricios eligebant: Legiones autem fiebant; Peditum sex millium, Equitum vero sexcentorum. Quæ utique verba moras Stewechio, Savilio, Rosino, Panvinio, Sigonio facientia, ex Dionys. (15) Halicarnassensi optime nostra quidem opinione sic explicantur. Erant Romulo, post odiosam illam cum Remo fratre pugnam, e veteribus colonis, qui cum eo Romam condidere, quasi tria Peditum millia, pauciores quam trecenti Equites. Civitate vero duplicata, & cum ea similiter Patriciorum numero, duplicata etiam est Militia: Sic, ut Plutarchus non tam de numero militum in una eademque Legione, quam de numero Legionum aucto (pariter atque de aucta Civitate, & de numero patriciorum aucto) itaque de militibus in iis συναθροισμῶσι intelligi mereatur. Quæ quidem ejus significatio, illorum

(2) Sallustii Fragmenta, & ad ea Douzæ Notas. Cantabrigiæ, M DCC X. pag. 73.

(3) Pag. 74. (4) Varro de LL. Lib. IV. (5) In Romulo. (6) Livii Lib. VI.

Cap. XXII. (7) Lib. VII. Cap. XXV. (8) Lib. XLII. Cap. XXXI. Cum quina

millia & ducenti pedites ex veteri instituto darentur in Singulas Legiones. Vide ad hunc locum Doctissimi Perizonii notam. (9) Livii L. XXIX. Cap. XXV. (10) L. XLII.

Cap. XXXI. (11) Appianus de Bellis Civilibus, Lib. IV. (12) Sallustii Bellum Ju-

gurthinum § XCI. Rosini Antiquitates Rom. Lib. X. Cap. IV. (13) Appianus Alex. de Bellis Civilibus, L. V. (14) In Romulo. (15) Dionys. Halicarnassens. Lib. II. § 16.



temporum mori cum primis convenit: Certissimum enim est (imo quidem, ipso tradente *Plutarcho* (16), certissimum) Legionem a *Romulo*, quod ante dixi, institutam, Peditum fuisse trium millium, Equitum trecentorum. Unum errasse videtur *Historicus*, in re militari non nimis accuratus, quod primas *Romuli* Legiones *Συντάγματα τετρακώντα*, referat in plurali numero; quando diligentissimus investigator antiquitatis, *Varro* [*trium millium*, (17) ait, *primo Legio fiebat, ac singula Tribus Tatiensium, Ramnium, Lucerum millia singula militum mittebant:*] quod de unica tantummodo *Legione* subintelligendum, & lucem isti fœnerat interpretationi. *Optimi Scriptoris* (scil. *Plutarchi*) bonam hanc mentem mavult *Lipsius* (18), [*Romulum duplicasse Legiones populo jam duplici, & binas fecisse tot millium.*]

*EUTROPII* dictum (19) est [*Cum Latini, qui a Romanis subacti erant, milites præstare nollent, ex Romanis tantum tirones lecti sunt, factæque Legiones decem, qui modus sexaginta vel amplius armatorum millia efficiebat.*] Fallitur, inquit doctissima *Fæminarum Anna* (20), & ita errasse *Eutropium* miratur, cum expresse *Livius* (21) hac de re [*Ubique non urbana tantum, sed etiam agresti juventute decem Legiones scriptæ dicuntur, quaternum millium & ducenorum peditum, equitumque trecentorum.*] Ego potius, quamvis a *Femina* tam illustri dissentire vix sustineam, *Eutropii* manuscripti exscriptorem errasse puto; (neque enim *Historicus*, diligenter magna ex parte & accurate scribens, levi de causa temereque arguendus,) & quidem hunc in modum errasse. Scripsisse videtur *Eutropius* [*XL, vel amplius armatorum millia.*] Exscriptor autem, literas numerales, quod in proclivi est, transponendo [*LX.*] Hoc cum *Livio*, unde id hausisse videtur *Eutropius*, ad amussim quadrat.

*ALIUD* est, quod a significatione vocis *Centuria* ductum, opinioni de militum in *Legione* sub prima *Repub.* paucitate, videatur oppugnare; *Varro* (22) ait [*Centuriæ, quæ sub uno Centurione sunt, quorum Centenarius justus numerus:*] Hac *Etymologia* quidam, sed nec ii de *Literatorum* vulgo, freti, cum *Legio* *Centuriones* habet sexaginta, quod ita esse *Lex* jussit (testante *Dionysio* (23) *Halicarnassensi*, & apud *A. Gellium Cincio* (24), ducto sexagesimo in centesimum numero, *Legionem* militum sex millia, quasi calculi auctoritate, continere pronunciant. Sic a non nemine dicitur [*Legio sexaginta Centuriarum, seu sex millium.*] At minime novum est, voces a prima significatione plurimum desciscere. Vocem hanc *Centuriam*, utut de numero centenario primum usurpatam, successu temporis de numero multo minori fuisse dictam, ex *Tacito* (25) patet. Milites in seditione *Germanica* sub *Tiberio* sævitiam *Centurionum*

(16) In *Romulo*. Κτιθείσης τῆς πόλεως, πρῶτον μὲν ὅσον ἴσιν ἐν ἡλικίᾳ πλεῖστον, εἰς συντάγματα τετρακώντα διείλεν. Ἐκαστον δὲ σύνταγμα πᾶσιν τοῖς τετρακώσιον ἴσιν, καὶ τετρακωσίων ἰσπίων.

(17) *Varro* de *Lingua Lat.* Lib. 4to.

(18) De *Militia Rom.* Lib. I. Dial. V.

(19) Lib. II. § VI. (20) In ad eum *Eutropii* locum *Notis*.

(21) Lib. VII. Cap. XXV.

(22) Loco jam citato.

(23) *Antiq. Roman.* IX. Cap. X.

(24) *Noct. Attic.*

Lib. XVI. Cap. IV.

(25) *Annalium* Lib. I. Cap. XXXIII.



ulciscentes, [*in eos invadunt, prostratos verberibus mulctant sexageni singulos, ut numerum Centurionum adæquarent.*] Manifestum hic sexagenis solum præfuisse Centurionem. Quid quod isthuc verbo tenus argumentum, nequaquam ipsa cum re concordet: cum in omni Romana Historia, quæ initio reipub. militum sex millia comprehendat, Legio nulla reperiatur.

SUB exitum Reipub. cum, e viris in ea principalibus, suo fere quisque usus est ingenio, *Luculli* (26) Legiones habuerunt singulæ sex millia Peditum, trecentos Equites. *Cæsaris* Legiones millium erant ternorum: [*Cæsar cum Legionibus quæ terna millia militum Italorum habuerunt, Gallias subegit.*] Ita *Sextus Rufus* (27). Nobilis *Savilius*, nescio qua auctoritate, legit *quaterna*. *Antonius* (28) post Prælium *Philippicum* de Legionibus, μετὰ τῶν συντασσμένων, id est, mistis auxiliis, ita scripsit, ut Legionum singula sex millium sit; adeoque sine auxiliis, trium. Idem in *Luculli* Legionibus suspicandum arbitror, adnumerari scil. Auxilia; & ad numerum ter millesimum eas, per se consideratas, redigi oportere.

ALIA sub *Cæsaribus* Legio fuit, ut in aliis plerisque rebus, ita præsertim in numero militum; qui jam inde, *Cæsarum* mandato, maxima ex parte sexies millesimus, interdum eo major invenitur; Hoc ex *Vegetio* manifestum est, de hac re ita verba faciente (29), [*Romani Legiones habent, in quibus singulis sena millia, interdum amplius militare consueverunt;*] & (30) alio loco [*Legio plena habet Pedites sex millia centum, Equites septingentos viginti sex.*] Non de suo tantum ævo *Vegetius* hæc scripsisse judicandus, sed ad illorum, a quibus suam de re militari conscripsit *Epitomen*; in quorum numero fuit *Cornelius Celsus*; de quo *Volaterranus* (31), [*Cornelius Celsus, inquit, de Arte Rhetorica, de re militari, de rerustica, deque medicina libros conscripsit, verum ad nos tantum pervenit ejus medicina, oratorio modo conscripta.*] Ipsius etiam *Augusti* de re militari Constitutiones (quarum una a *Macro J. C.* in *Pandectis* (32) servata est) *Vegetius* se evolvisse narrat. Quinimo profitetur (33) [*Nihil sibi auctoritates assumere, sed horum quos supra retulit, quæ dispersa sunt (in Catone, Celso, Frontino, Augusti, Trajani, Adrianique Constitutionibus) velut in ordinem epitomata conscribere.*] Quare verisimile duco, sub *Augusto*, vel *Tiberio*, (quo Imperante *Celsus* scripsit) militum in Legione numerum ad sexies millesimum augeri, & nunquam post attenuari, eoque numero minorem reddi; quod partim ex *Frontino*, partim ex eo junioribus *Modesto*, *Hesychio*, & *Suida* patet. *Modestus* (34) ait [*Iis decem Cohortibus Legio plena fundatur, quæ habet Pedites VI Mill. CV, Equites DCCXXVI.*] Ille *Tacito* Imp. floruit, eique [*de vocabulis rei militaris.*] Libellum inscripsit. *Hesychius* (35) λέγων πλῆθος στρατόμαχου ἢ τάγματις ἐξ χιλιάδων ἑξακοσίων ἐξήκοντα ἕξ. *Suidas* (36) autem λέγων ὡς παλαιὸς

(26) Appian. de Bellis Mithridar. pag. 368. (27) In Breviario. (28) Appian. de Bellis Civilibus, Lib. V. p. 1075. Ed. Amst. MDCLXX. (29) De re militari; Lib. II. Cap. II. (30) Cap. VI. (31) Lib. XIV. (32) Digest. Lib. XLIX. Tit. XVI. (33) De re militari, Lib. Cap. VIII. (34) Lugduni Batav. ex officina Plantin. CIOLXXCII. pag. 291. (35) Vocce Λεγών. (36) Ibi.



ἑξακίχλιοι ἑξακίχλια. *Legio* apud Romanos sex millibus militum constans. Adeo patet ab *Augusto*, *Romani* Imperii conditore, ad ejus usque terminum, Legionem fena millia (& eo amplius aliquando) continere. Hæc de numero Militum in *Legione plena* hætenus.

AD Legionum altero loco numerum descendamus, & quotus ille fuerit, eodem tempore, quoad ejus fieri potest, investigemus. Diversis temporibus diversum fuisse constat, & necesse est; prout Bella nunc gravia, nunc plura postularent, aut pace parum opus essent milites. Ex hac varietate de populi *Romani* variis ætatibus, ut & in earum singulis de ejus robore, uno conspectu sed & amœno, possimus aliqua ex parte judicare.

ROMULI sicut dictum est, primo fuit *Legio* tantum una: Deinde, in duplum aucta Civitate, binæ. Tametsi *Milites Romani* (37) ad quadraginta mille, & eo amplius sub *Romulo* augerentur; tametsi [*omnem militarem disciplinam, artemque bellandi*] *Tullus Hostilius* a (38) *Floro* condidisse tradatur; Legionum tamen numerum, sub Regibus, ultra binas augeri nullus invenio.

IN omnibus auctoribus, ait (39) *Vegetius*, invenitur, singulos *Consules* adversus hostes copiosissimos, non amplius quam binas duxisse *Legiones*, additis auxiliis *Sociorum*. Tanta in illis erat exercitatio, tanta fiducia, ut cuivis bello duæ *Legiones* crederentur posse sufficere: ] quo nihil a vero magis alienum. Nam e diverso *Dionysius*, Auctor gravissimus, in Bello contra *Volscos*, (40) *Κὶ γὰρ δέκα ἑξακίχλια πένγματα ἐξ ἀνδρῶν πεξακίχλιων ἕκαστον. Τέτων τερία μὲν ἕκαστος τῶν ὑπάτων ἔλαβεν ὃ τῶν ἱππέων ὅσον ἕκαστος περσεμερείῃ.* Decem, inquit, *Legiones* conscriptæ sunt, --- ex his *Consules* utrique ternas accepere, & *Equitum* quantum unicuique distributum est. ] *Livius* (41) de eodem Bello [*Legiones decem effectæ sunt. Ternæ inde datæ Consulibus: quatuor Dictator usus est.*] Plures sæpenumero fuisse *Legiones* certissimum est, & earum magna ex parte duas tantum sub imperio *Consulum*, reliquas *Proconsulum*, *Prætorum*, *Proprætorum*, *Præsidum*, *Legatorum*ve mandatis obsequi.

*Q. Fabio* quartum & *M. Marcello* tertium *Cofs.* A. U. Cond. circiter 538. [*Duodeviginti Legionibus bellum geri placuit.*] (42)

*Fulvio* & *Sulpitio* *Coss.* id est, A. U. Cond. circiter 541, [*Tribus & viginti Legionibus Romanis bellum terra marique gestum.*] (43)

Ante prælium *Pharsalicum* erant *Cæsari* *Legiones* X, *Pompeio* XI; præter auxilia quamplurima (44).

*Cassio* & *Bruto*, cum *Antonio* & *Octavio Cæsare*, pugnam inituris (45), erant pariter utrinque *Legiones* XIX. in summa XXXVIII.

*Octavio Cæsari*, devicto *Lepido*, *Legiones* erant quatuor supra quadraginta. (46)

(37) *Dion. Halicarn. Antiquit. Roman. Lib. II. Cap. XVI.* (38) *Lib. I. Cap. III.*  
 (39) *Lib. II. Cap. IV.* (40) *Dionys. Hal. Antiq. Roman. Lib. VI. Cap. XLII.*  
 (41) *Lib. II. Cap. XXX.* (42) *Livium, Lib. XXIV. Cap. XI.* (43) *Lib. XXVI.*  
*Cap. I.* (44) *Appianum de Bellis civilibus Lib. II.* (45) *Lib. IV.* (46) *Plutarchum in Antonio.*



Eidem porro se a pugna *Actiaca* (47) submisere Legiones *Antonii* numero XIX.

*Octavio* rerum *Romanarum* undique potito, (reformata jam militia, & militum in Legione quavis numero ad sexies millesimum aucto) Legiones (48) erant XXII; vel ut alii volunt XXV.

Sub *Tiberio* (49) Legiones erant XXV. *Neroni*, tradente *Tacito*, Legiones erant quinque supra viginti: præter alias Legiones duas *Clasificas* & in urbe XII. cohortes. Fuerunt igitur, ex *Lipsii* (50) calculo, civiles ei copiae, Legionum circiter XXX.

Eundem *Adriano* fuisse numerum, ex celebri illo *Favorini* dicto manifestum est.

*Dionis Cocceiani* ævo, i. e. Imp. *Alexandro Severo*, Legiones (48) erant XXIX.

A T omnium maxime Lapidēs ii sunt æstimandi, quorum alter *Capitolinus*, alter *Romæ* apud *Maffæos*, numerum & nomina exhibent Legionum: Horum Inscriptiones cum productis nominibus, accurate magis, quam unquam vidi, impressas, in medium feram.

*Romæ*, in *Capitolio*, Columella rotunda. Nomina Legg.

II. AVGuſta.	I. ADIVTrix.	III. SCYTHica.
VI. VICTrix.	III. FLAViana.	XVI. FLAViana.
XX. VICTrix.	VII. CLAVDiana.	VI. FERRAta.
VIII. AVGuſta.	I. ITALICa.	X. FRETEſis.
XXII. PRIMigenia.	V. MACEDonica.	III. CYRENaica.
I. MINERvia.	XI. CLAVDiana.	II. TRAIana.
XXX. VLPiana.	XIII. GEMina.	III. AVGuſta.
I. ADIVTrix.	XII. FULMinatrix.	VII. GEMina.
XIII. GEMina.	III. GALLICana.	III. ITALICa.
I. PARTHica.	II. PARTHica.	III. PARTHica.

Qui ſequitur Legionum Catalogus, trium numero auctior eſt.

II. AVGuſta.	II. ADIVTrix.	III. SCYTHica.
VI. VICTrix.	III. FLAViana.	XVI. FLAViana.
XX. VICTrix.	VII. CLAVDiana.	VI. FERRAta.
VIII. AVGuſta.	I. ITALICa.	X. FRETEſis.
XXII. PRIMigenia.	V. MACEDonica.	III. CYRENaica.
I. MINERvia.	XI. CLAVDiana.	II. TRAIana.
XXX. VLPiana.	XIII. GEMina.	III. AVGuſta.
I. ADIVTrix.	XII. FULMinatrix.	VII. GEMina.
X. GEMina.	XV. APOLLinaris.	II. ITALICa.
XIII. GEMina.	III. GALLICana.	III. ITALICa.
I. PARTHica.	II. PARTHica.	III. PARTHica.

(47) Plutarchum in Antonio.

Lib. IV.

(48) Dionem, Lib. LV.

(50) Analeſta ad Militiam Romanam.

(49) Taciti Annal.



INSCRIPTIONES hæc *Dionis* ævo posteriores esse, palam est ex eo, quod plures utraque Legiones habeat, quam ab illo memorentur; unam scil. *Capitolinam*, *Maffæanas* quatuor. Hæ de Legionum numero Dissertationem claudunt; quando nihil amplius hac de re apud Historiæ Romanæ Conditores observare contigit.

HÆC, ex fidei bonæ Auctoribus & Lapidibus accepta, notatu digna præbent quamplurima.

Primo, sub Consulibus plures eodem tempore fuisse Legiones, quam sub Imperatoribus; & sub Regibus omnium paucissimas.

Deinde, sub Consulibus plures in Bellis Civilibus, quam externis.

Deinde, sub Consulibus minus certum earum esse numerum, & Copias magis variari, quam sub Regibus aut Imperatoribus.

Deinde, sub Imperatoribus, numerum quasi solennem, ut ait *Lipsius*, esse XXX circiter Legionum.

Deinde, nemini unquam hominum plures fuisse Legiones, quam *Octavio Cæsari*; uti nemini unquam Romanorum, ex Sententia (51) *Lipsii*, Militiam florentiorem, quam *Trajano*.

Postremo, ex uno Legionum numero, de viribus exercituum, minime posse recte concludi.

B I N I hic Canones sanciri possunt, qui in *Romana* Historia, rei præsertim militari intelligendæ, usui erunt non exiguo. Horum primus est: *Ubi militum numerus in exercitu, nullus autem Legionum numerus exprimitur, [qui plerumque Appiani mos est] ut exercitus ad Legiones reducatur, advertendum est illius ævum, & in eo quotus soleret esse militum in Legione numerus: Ducto enim eo in militum totius exercitus numerum, emerget in eodem Legionum numerus.* e. g. *Luculli* contra *Mithridatem* exercitus fuit [tradente (52) *Appiano*] Peditum 30,000, Equitum 1600: id est [dato in singulam Legionem numero 6200, qui mistis auxiliis fuit istius ævi militum in Legione numerus] Legionum quinque. *Septuaginta millium* exercitus a *Boadicia* [tradente (53) *Tacito*] occisus est; id est, datis, secundum istius seculi morem, unicuique Legioni 12000, sex circiter Legiones.

CANON alter est, *Datis in Legione cujuscvis sæculi militum, una cum Legionum in ejusdem sæculi exercitu numeris, oriatur inde militum in eo exercitu numerus.* Hinc patet *Romuli* milites, Legione primum una comprehensos, non excessisse 3000, vel secundum *Plutarchum* 3300. Deinceps, admissis *Sabinis*, & cum Civitate duplicata Legione, 6000, vel 6600. Nec quidem plures, etiam si (quod supra diximus e *Dionisio*) cum ex hominum conspectu sublatus hic esset, erant *Romæ* Milites 45,000. In Bello contra *Volscos*, *Æquos*, & *Sabinos*, cum X Legiones essent, & in omni Legione 4000 Milites continerentur, Militum numerus 40,000, esset, necesse est. Sub Imperatoribus cum Legiones fere XXX, numero æquabant, Milites, quoties illæ plenæ erant (ducto scil. 30 in 6500) 195,000, vel 200,000 plus minus habuere: & additis Sociis, quorum erat æqualis numerus, 400,000. Hæc Imperii fuit *Romani* Magnitudo.

(51) *Analecta ad militiam Romanam.* (52) *Appianum de Bellis Mithridaticis.*  
(53) *Annalium Lib. IV.*



V. De *Romanorum Aquila* dubitas, utrum Auro Argentove incrustata fuerit? *Of the Roman Eagles, by the same, to Mr. Cuper. n. 337. p. 145.* [veteres, inquis, eam Auream vel Argenteam faciunt totam.] At, Amicorum optime, quis unquam veterum hoc affirmavit? Scio quidem (eruditissime *Cupere*) Te cum *Stewechio* & *Lipso*, militiæ Romanæ scientissimis, stare. Scio *Dionem Cocceium* (1) Ἀετὸς χρυσῆς, *Arrianum* (2) Ἀετοὶ σέμναλα χρυσᾷ de *Romanis Aquilis* adhibuisse. *Xenophon* etiam, de *Persis* scribens, (nam à *Persis* Aquilæ sunt acceptæ) Αἰτὸν τινα χρυσῶν (3), & αἰτὸς χρυσῆς (4). Sed longe hæc a scopo.

*Suggestum* in Curia, (sic a *Floro* (5) dicitur) five *Sellam* (ut *Suetonius* (6), & *Cicero* (7) eam appellant,) quam Senatus *Julio Cæsari* decrevit, totam ex Auro fieri, vix credibile est; verum potius (ut vult (8) *Buchnerus*) auratam, & multo Auro obductam. Si quis autem isthanc opinionem pertinaciter defensum iverit, *Plutarchum* (9) & *Dionem* (10) habebit adversarios; a quibus hæc eadem Sella Δίφρος Ἰνίχρυσος, i. e. Auro inductus five obductus, in summa sui parte inauratus, dicitur: Ut, a *Suetonio* (11) [*Sedes Aurea*] & plus semel a *Cicerone* (12) *Elegantiarum* patre, qua significatione Sella hæc dicatur *Aurea*, facile sit perceptu. Domum incendio absumptam, restitutamq; *Nero* (ex auratis proculdubio Columnis, ostiorum postibus, Fenestris, & id genus aliis) *Auream* (13) nominavit, non ex Auro fabricavit.

Notum etiam est, a *Cicerone* (14) Aquilam militarem dici *Argenteam*; sed id significare [totam eam ex Argento fieri] non est probabile; cum in triumpho *Pompeii* magni, *Mithridatis* Currus [*Aureos, Argenteosque fuisse*] tradit *Plinius* (15). Hoscine vero totos fuisse *Aureos* opinabimur? minime gentium. Ipsa rei ratio contradicit. Quis enim nescit, Tritum hæc Metalla non pati? Quis nescit, Auri id pondus esse, ut Currus ex eo factus, quod trahi respuat, (nisi minutulus, ad Puerorum ludicra) omnino sit inutilis? In hujusmodi dictis, non solum verborum sono, & primo eorum sensui, sed & ipsi naturæ rei consulendum: Quæ si, in veterum Auctorum interpretatione, diligenter observetur Regula, in iis explicandis exponendisque, usus erit profecto non exigui.

Hoc quasi filo ducti, Labyrinthum hunc ingrediamur; primoq; advertamus, *Aquilam* esse totius Legionis Insigne, fulgens, hastæ longæ extremitati affixum; ut ab Aquilifero erectum, & a militibus, (præcipue primæ Cohortis) ii vero in Legione, ut ex *Vegetio* (16) patet, Pedites mille centum quinque, Equites centum triginta duo (i. e. 1237) erant, aspectum, usui sit tanto eorum numero, in servandis ordinibus, in custodiendis intervallis, atq; adeo forma aciei retinenda. Alta ergo, & magna sit *Aquila*, necesse est, ut proposito respondeat: Primum ejus Altitudinem, & deinde Magnitudinem indagabimus:

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(1) Lib. XL. (2) Dissertationibus *Epicteti*. (3) *Xenophon*. Anab. (4) *Pædia Cyri*, Lib. VIII. (5) Lib. II. Cap. XI. (6) De *Julio Cæsare*, Cap. XXVI. (7) *Philippic.* 11. 85. De *Divinatione* 1, 19. (8) *Thesaurus Eruditionis Scholasticæ*, voce *Aureus*. Ed. *Lipsiensis*. 1692. (9) In *Cæsare*. (10) Lib. XLIV. (11) Loco jam citato. (12) Locis jam citatis. (13) *Sueton.* in *Nerone*, Cap. XXXI. (14) *Oratione in Catilinam*, Cap. IX. (15) Lib. XXXIII. Cap. XII. (16) Lib. II. Cap. VI.



In *Adlocutionibus*, quas Nummi *Romani* passim repræsentant, iis præcipue, quæ justæ longitudinis hastam humi defixam habent, & *Aquilam* ad perpendiculariculum elevatam; his, inquam, in Nummis, *Aquilæ* & *Hastæ*, cui imponitur, simul sumptarum altitudo, ad Aquiliferi altitudinem esse solet, ut 4 ad 3; five in ratione sesquitertia, præterpropter. Ut in Nummis *Caii Cæsaris*, (17) & *Galbæ*, (quos ex *Ære* majusculos possideo, & jam nunc in manibus habeo) aliisq; licet observare, *Galbæ* (18), *Hadriani* (19), *Gordianique* (20); quorum figuræ, prelo impressæ, extant; & in Nummo *Othonis*, (quem etiam possideo) *Securitatem P. R.* exhibente. Dato jam Aquiliferum sex pedes altum esse, (quæ utiq; statura in istiusmodi milite *commoda* censeatur) hinc sequetur, *Aquilam* & *Hastam* simul acceptas, altas esse pedes octo. Hujus altitudinis pars minimum duodecima tribuenda est *Aquilæ*, cujus profunditas erit *unciarum octo*. Ex profunditate corporis hujus Aquilini, de ejus cæteris dimensionibus possumus conjicere; & ex iis de ejus *Pondere*. Erit pondus hujusce *Aquilæ*, si ex *Argento* fuerit, librarum circiter 300 *Trojan.* si ex *Auro*, 600 *l. Trojan.* At tantæ molis *Auro*, vel etiam *Argento*, *Hastæ* summæ imposito, in altum elevando ferendoque parem, quem tandem inveniemus *Aquiliferum*? Profecto, quod in causis antiquitus solebat dici perobscuris, *Non liquet*.

*Lipsius* (21) hic opponit ex *Floro*, in clade *Variana* [*Signiferum Aquilam intra Baltei sui latebras gerentem, & in cruenta palude delitentem*,] ne scil. potirentur ea hostes; ex eoque corpus *Aquilæ* non magnum esse judicat. Balthei latebras, quam velit ille maximas, & quidem ejus, qui vel *Garagantue* circundaretur, lubentius concederem, quam *Aviculam*, *Passerem*, vel *Rubellionem* magnitudine vix superantem (qualem *Lipsius* eam esse vult) *Aquilæ Romanæ* vires & munera præstare; sed ut *Florus*, in aliis hujus narrationis partibus, turpissime falsus est, (qua de re videantur *Ryckii* (22) ad *Tacitum* *Animadversiones*;) ita quidem minime audiendus, in ea, qua de *Aquilæ* magnitudine adeo dissentit, tum a reliquis optimæ notæ Auctoribus, tum ab ipsa rei natura veritateque.

Ego quidem (ut de *Aquilæ* fabrica, ex ejus usu, ferrem sententiam) e *Ligno* quodam, vel *Subere*, vel materia five *Coriacea*, five *Chartacea*, vel hujusmodi aliquo levidensi, *Lamina* five *Argentea* five *Aurea* obducto, cum *Alis* ejusdem *Laminæ* in altum expansis, & interdum *Tonitru* sub *Aquilæ* pedibus, eam fieri conjecto. Talis enim proposito responderet. *Aquilæ* parvitati immodicæ non parum favent ea, quæ de *Sacello* ejus, ab Auctoribus nimis obscura, neque recte satis, exhibentur. Aliqui *Sacellum*, & in eo *Aquilam*, *Hastæ* superponi volunt: Sed (ut apertissime (23) *Lipsius*) *Cave sentias in Hasta ipsa simile quidpiam adfuisse Templi*. Ad *Castra* id referendum est; in quorum principiis *Ædicula* quædam, five *Templum* erat, in quo, Religionis ergo, *Aquilæ* & *Signa* servabantur, adorabantur: quod ex *Herodiani* lib. iv. probatur. Hoc autem adjicere placet *ἱερὸν*, quod a *Lipso* præ-

(17) Vide Tab. II. (18) Stewech. Comment. ad lib. III. Vegetij, pag. 271. (19) Ibid. (20) Acta Eruditorum Mensis Maii, MDCXCIII. (21) De Militia Romana, lib. IV. (22) Pag. 33. (23) Commentario ad Lib. II. Annalium Taciti.



Fig. 1.



Fig. 2.



Fig. 3.



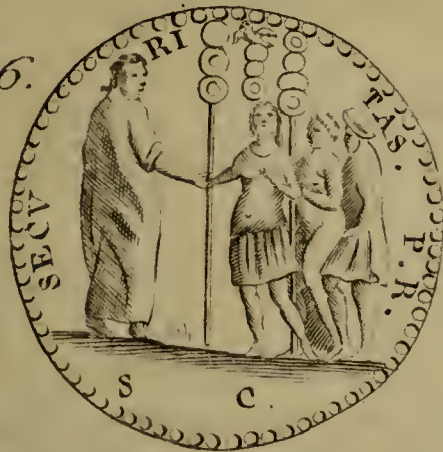
Fig. 4.



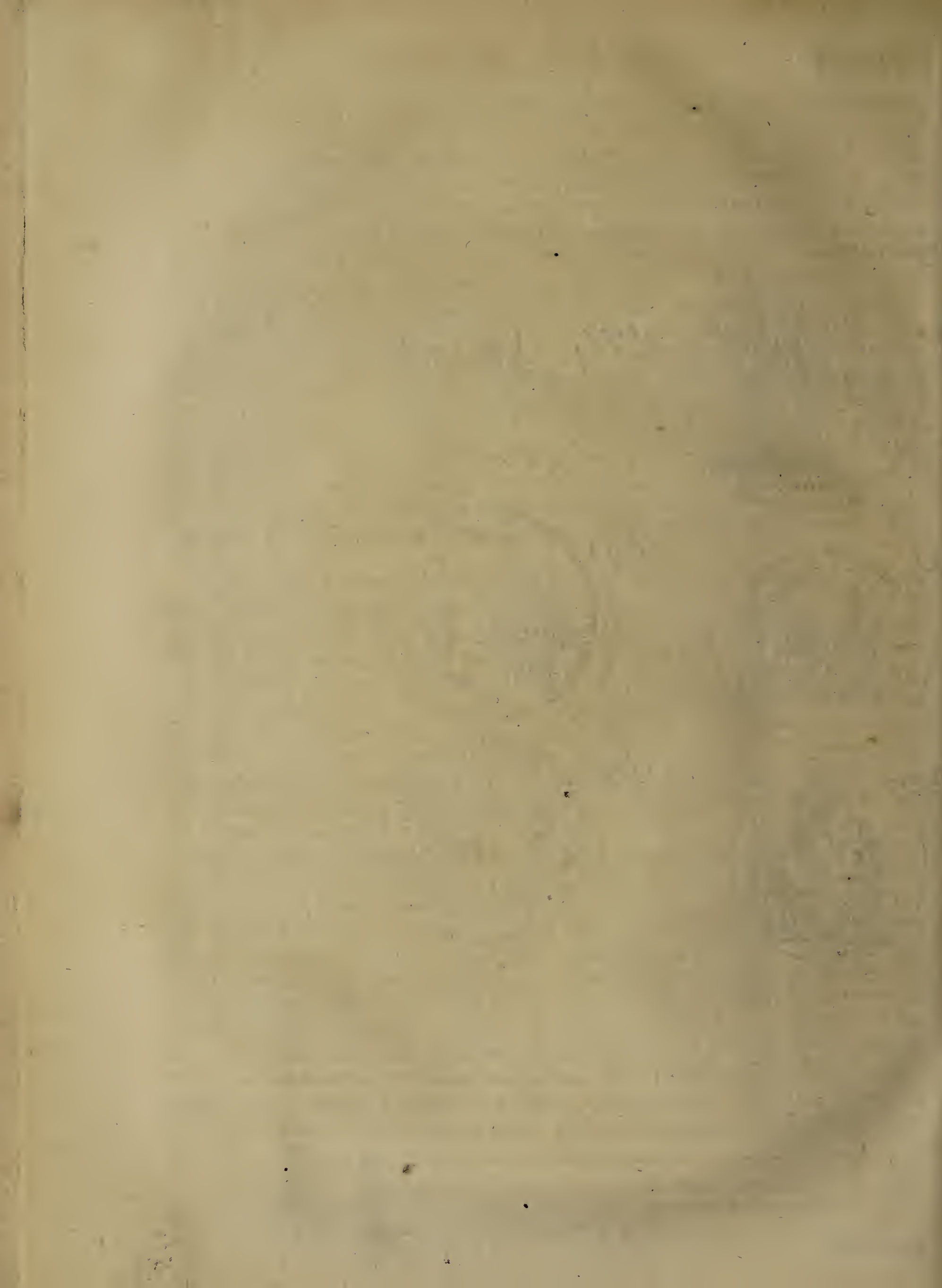
Fig. 5.



Fig. 6.









termiffum eft, nempe ad Domos etiam privatas id referri poffe videri. Ita enim (24) *Cicero de Catilina* [*Aquilam Argenteam, cui domi tuæ facrarium ſclerum tuorum conſtitutum fuit.*] Quod ab alijs *Aquilæ Sacellum, Templum, & Ædícula* fuit, *Sacrarium* id a *Cicerone* dictum, & quidem in privata Domo poſitum.

Hanc rem conſideranti, nemo eam acu tetigiſſe mihi magis videbatur, quam *Ant. Auguſtinus* (25), qui ita ſcribit, [*Legiones ſingulæ Aquilam ſculp- tam geſtabant, hæſtæq; impositam, Auro Argentove incruſtatam.*] Quæ quidem illius verba, rem, ut opinatus ſum, veram exprimentia, in *Commentarium* meum retuli: rectene vero, an ſecus, cedo quemvis arbitrum.

*Tabulæ Explicatio.*

I. Nummus *Galbæ*, in altera parte habens ejus Effigiem, cum hac Inſcriptione, IMP. SER. SVLP. GALBA. CÆS. AVG. TR. POT. In altera *Adlocutionem*, quam hic exhibemus. II. Nummus *Hadriani*, cujus alterâ facie, HADRIANVS. AVG. COS. III. P. P. Alterâ hæc *Adlocutio*. III. Nummus *Gordiani*: cujus altero latere, IMP. GORDIANVS. PIVS. FELIX. AVG. altero, quæ hic cernitur, *Adlocutio*. Reliqui tres Nummi e meis ſunt, ærei, ejusdem Magnitudinis cum Figuris; nempe, IV. Nummus *Cæſaris*; cujus altera pars habet, C. CAESAR. AVG. GERMANICVS. PON M TR PO. (i. e. Pontifex Maximus, Tribunitiæ Potestatis.) Altera hanc *Adlocutionem*. V. Nummus alter *Galbæ*; altera parte habens, SER. GALBA. IMP. CAES. AVG. altera, *Adlocutionem*. VI. Nummus *Othonis*, cujus altera facie, IMP. OTHO. CAES. AVG. TR. POT. altera, SECURITAS. P. R.

Notatu dignum eſt, in omnibus hiſce Nummis *Aquilas* ejusdem fere altitudinis eſſe, nempe tres ſupra caput Aquiliferi circiter pedes; unde licet con- jicere, quod tametſi *Hæſtæ*, quibus ſuperimpoſitæ fuerunt *Aquilæ*, non in Nummis omnibus exprimantur, tamen, cum in Nummis 1, 2, 3, 4, inte- gre ad terram uſque producantur, ejusdem alias cum hiſce longitudinis eſſe.

VI. Mr. *John Somner*, in the Month of *September*, 1668. ſinking a Well at a new Houſe of his in *Chartham*, a Village about three Miles from *Canterbury*, towards *Aſhford*, on a ſhelving Ground, or Bank-ſide, within twelve Rods of the River, running from thence to *Canterbury*, and ſo to *Sandwich Haven*; and digging for that purpoſe about ſeventeen Foot deep, through gravelly and chalky Ground, and two Foot into the Springs; there met with, took and turned up a parcel of ſtrange and monſtrous Bones, ſome whole, ſome broken, together with four Teeth, perfect and ſound, but in a manner petrified and turned into Stone; weighing (each Tooth) ſomething above half a-Pound, and almoſt as big (ſome of them) as a Man's Fiſt. Check-Teeth, or Grinders, as to the form, they are all, not much unlike, but for the bigneſs, the Grinders of a Man. And whereas I ſaid, *almoſt as big, ſome of them, as a Man's Fiſt*: It brings to my Remembrance

*Strange Bones near Canterbury, by Mr. W. Somner. n. 272. p. 882.*

(24) Loco jam citato. (25) Dialog. III. Antiquitatum in *Cappadocia*.



what I have read in *Ludovicus Vives*, of such a Tooth, but a little bigger; (*Dens molaris pugno major*, he saith; that is, a *Cheek-Tooth*, bigger than a *Fist*) which was shewed to him for one of *St. Christopher's Teeth*, and was kept in a Church that bare his Name; which whether he believed or not, I know not; but contradict it he doth not I am sure; neither he, nor his learned Companion, whom he doth name there. Just such another Tooth of the bigness, he saith, of an ordinary *Fist*, was seen by *Acosta*, (a very creditable Author) in the *Indies*, digged out of the Ground, in one of their Houses there, with many other Bones; which put together, represented a Man of a formidable, or as he speaketh, *deformed bigness*, or *greatness*, as he judged of it. And so must we have judged of these Teeth, and of the Body to which they belonged; had not other Bones been found with them, which could not be Man's Bones. Some that have seen them, by the Teeth, and some other circumstances, are of opinion, that they are the Bones of an *Hippopotamus*, or *Equus Fluvialis*, that is, a *River-horse*; for a *Sea-horse*, as commonly understood and exhibited, is a fictitious thing. Yet *Pliny* makes *Hippopotamum* (*mari, terræ, amni communem*) to belong to *Sea*, *Land* and *Rivers*. The Earth or Mould about them, and in which they all lay, being like a *Sea-earth*, or *Fulling-earth*, not a *Stone* in it, unless you dig three Foot deeper, and then it rises a perfect *Gravel*. We have with the help of an able *Limner*, adventured on a *Scheme*, or *Figure*, of several of the Teeth and Bones, with their respective Dimensions, of breadth, length, and thickness.

From a due consideration of the Place, and the adjacent Country, and other incidental Circumstances; I am inclin'd to think they belong'd to some *Marine* or *Sea-bred* Creature, to which the Land can lay no Claim. The Question is, how it should be found in any Land, and at such a depth under Ground? For Solution whereof, we shall discourse on the four following Queries.

1. Whether the Situation and Condition, Face and Figure of the Place may possibly admit of the Seas once insinuating itself thither?
2. Whether (that possibility being granted, or evinced) the Sea did ever actually insinuate itself so far as to this place, and when?
3. How in probability, and when this Valley or Level, being once *Sea-land*, should come to be so quite deserted and forsaken of the Sea, as it is at this day; the Sea not approaching by so many, a dozen Miles, or more.
4. By what means, the Sea once having its play there, this Creature comes to lodge, and be found so deep in the Ground, and under such a shelving Bank?

As to the first (the Places capacity and aptitude for the Sea's influx, or insinuation) such as know the Situation, withal cannot but know, and must agree it to be so. As for Strangers, and such as are unacquainted with the Place, for perfecting Information in what either the common Maps, or a particular Scheme and Draught of the Level, herewith intended, may chance to be defective in; they may please to know, that the Place (*the locus loci*) we are upon, is a Part of that wide, fair and fruitful Level, or Valley, extending itself not less than twenty Miles in length, between a continued series  
and



and range of Hills, Downs, or high Grounds, lying at a pretty distance each from other all the Way; beginning at the *East Kentish*-shore, and stretching itself Westward, by *Sandwich*, *Fordwich*, *Canterbury*, *Chartham*, *Chilham*, *Godmersham*, *Wy*, *Ashford*, sometime in a direct, sometime in a winding Course, as far at length, as to that famous spacious Level of *Romney-marsh*, and is washed and watered all along, at least from about *Ashford*, by a sweet and pleasant River running through the midst of it, as far as to *Sandwich*, and there by the Creek, or Haven, emptying itself into the Sea; nothing at all of obstruction, by the interposition of Hills, or high Grounds, hindring or controlling the Sea's free play and passage for so many Miles together. The Place then, with the Parts, the Tract above and below it, from the Condition, or Constitution of it, is plainly not unapt or incapable of the Sea's Insinuation and Influence. If any shall object, *Canterbury's* being in the Way, as an Obstruction or Bar; they are easily enough answered. For although that City seemeth, and indeed is, at this Day, for the most Part somewhat elevated above the Pitch of the rest of the Valley or Level we are upon; yet not so much as to defend itself many times from Floods, and Overflowings in the lower, and most depressed Parts of it, even by the Springs it stands upon, to her great Damage and Annoyance; towards the helping whereof, by the Care and Providence of former Ages, it is very certain, and by digging Wells, Vaults, Cellars and the like, daily experimented, that the most Part of the City, not excepting the very Heart and Center of it, is made and raised Ground; the Tokens of Foundations upon Foundations, to a very considerable Depth, daily appearing, and the Ground (as at *Amsterdam*, *Venice* and elsewhere) for supporting Superstructures, in several places often stuck and stuffed with Piles of Wood, or long Poles and Stakes, forced into the Ground, as Wells and Cellar-diggers have inform'd me. Nay, and as if where about now the Bull-stake Market-place is kept, the River had sometime had its Course or Current, Pits and otherlike Tanners Utensils, have, not many Years since, been met withal in digging for Cellars thereabouts. To this let me add, that my very next Neighbour in *Castle-street*, within these thirty Years sinking a Cellar, did a good Depth (*five or six Foot deep*) light upon, and was put to some stop and stand in his Work, by a strong and well couched arched Piece of *Roman* Tile or Brick, which he was fain to take, or break asunder, and remove, before he could proceed. Hereof I was an Eye-witness, and (for Curiosity sake) took one of the Bricks or Tiles to my self, which with some otherlike *Roman* remains (some found in that which is my own Garden) I keep by me to this Day. However then, *Canterbury* may now seem to stand in the *Æstuary's* way; yet time was when in probability it did not; when I mean the Place, the Soil which now the City occupies, as the rest of the whole Valley both above and below it, was of too low a Pitch, to be an obstacle to it.

As to the second Enquiry, (whether probably the Sea did ever actually Insinuate itself so far as to this Place, and when?) the Answer is nothing so easie: Record of it we have none. The best and eldest Account we have now of the Condition, Site and Constitution of these our Eastern  
Parts



Parts and Tract, we owe to *Julius Cæsar*, and the *Romans* after him; from whom (alas) we have not the least Spark of Light to such a Discovery; rather indeed the contrary; both the Sea-coast, and In-land Parts, by his and their Relation, bearing in a manner one and the same Face and Figure then as now. However, that the Level we are upon was sometime an *Æstuary*, or Arm of the Sea; several *Criteria*, or Tokens, are not wanting. For example; besides what may be argued and inferr'd from this parcel of strange Teeth and Bones now under consideration; much (as I conceive) there is of probability for it, resulting from our River's name of *Stoure*, more antiently, not seldom both called and written *Æstur*, *Esture*, &c. which I doubt not to proceed and come from the Latin *Æstuarium*, and in process of time to have been corrupted and contracted into *Sture* and *Stoure*; giving name in part to *Stourmouth*, a place (a Parish) about six miles Eastward from *Canterbury*; so called from the River's disemboguing there into the Sea, or Salt-water, flowing up thither; as also giving name to that Mannor of the Archbishop's, at this day, and for some Ages past called *Westgate-Court*, at *Canterbury*; but more antiently, as in the Conqueror's time (witness *Domesday-book*) called the Mannor of *Esture* and *Esturesate*, from its situation by the *Sture* or *Stoure*. From which occasion doubtless, the late Lord *Finch*'s Seat in ——— about five or six Miles nearer to the Spring head, at this day vulgarly miscalled *East-steward*, is of old sometime called *Esture*, sometime *Etsture*. From *Saxon* Monuments and Records I could easily trace the name up to a very high date, by many examples.

But to leave that, and proceed to other *Criteria*; as by the Teeth and Bones now under consideration, we have an instance on that side of the Valley for the probability of the Sea's *quondam* occupation of it; so I shall give you here another no less remarkable from the other, or opposite side of it. By credible relation and assurance then you may know, that a place called *Westbere*, an obscure Village about three miles from *Canterbury*, Eastward, lying under the brow of the Hill stretching out by *Upstreete*, as far as to the West end of *Sarr-wall*, by which you make your entrance into *Thanet*; upon the like occasion to that here at *Chartham*, (the digging, or sinking of a Well) at a very great depth, store of Oysters and otherlike shells, together with an Iron Anchor, firm and unimpaired, were found and turned up in our time. The like I have been told of an Anchor in our days digged up at *Broomedowne*, on the same side of the the Level somewhat above *Canterbury*, Westward.

Let us now come to our third Query, and see if happily somewhat may not thence result adminicular and suppletory to what may be defective and wanting in the former. Our third Query now is, how in probability, and when this Valley or Level, being once Sea-land, should come to be so quite deserted, and forsaken of the Sea, as it is at this day, the Sea not approaching it by so many, a dozen miles, or more? In answer whereof, I must needs say and grant, that in case this Level were once Sea, an *Æstuary* I mean, or Arm of it; so very long it was ago, as we may not reasonably think, that *Canterbury* (whether as a City, or never so mean a *Pagus* or Village)



Village) was then *in rerum natura*, or a place inhabited; which happily it may have been if not as long as *Julius Caesar's* days, yet undoubtedly not long after. For an account we have of it (as of some other places in *Kent*) in the *Romans* time, both from *Ptolemy* the Geographer, *Antoninus Itinerary*, and elsewhere. Now (as was hinted e'rewhile) elder Records either of *Kent*, or of *Britain* that we may confide in as Authentick, we have none that I know of before the *Romans* time: no written credible evidences to help us in this Scrutiny. We must therefore either sit us down, and rest contented to throw off all farther enquiry, or else cast about for information as we can. Such as are for this latter will tell you, that the World (all know) is very aged, many thousand Years old, and that many and manifold are the alterations, changes and mutations, which time hath made in several parts and quarters of the World; to the notice and discovery whereof no written Record, or unwritten Tradition at this day, can reach or direct us: Tradition it self (longer liv'd many times than any written evidence) failing us for age. Of such a nature they conceive may this of the *Æstuary* be, so very ancient, as time hath quite worn out the memory of it; withdrawn all light from us, that might conduct us in the scrutiny, and left us as Men in the dark, without either *vola* or *vestigium* to stumble out our Way, and rove and ramble at uncertainties. Such a one happily shall he be thought, that adventuring to conjecture at the reason and occasion of the Sea's recess here, with an absolute valediction to the place of its wonted resort, shall pitch upon the Seas breaking, bursting and cleaving asunder that *Isthmus*, or neck of Land, between *Gaul* and *Britain*, rendring the latter of the same Continent with the former; such things ('tis certain) have hapned elsewhere. Thus (saith *Seneca*) hath the Sea rent *Spain* from the Continent of *Africk*. Thus (as he adds) by *Deucalion's* flood, was *Sicily* cut from *Italy*. More instances of this kind may be found in Mr. *Camden's Cantium*, and elsewhere. And although there be no certain evidence of such an accident here from ancient either Historians or Geographers; yet is the thing so strongly and rationally argued, by him especially, as by *Verstegan* also, *Twine* and others before him; and the conjecture back'd with such plenty and probable *Criteria*, by the former; that what others may think I know not; but were I of the Jury, I should more than incline to concur with them, who find for the *Isthmus*. Especially, when to the plenty of Arguments mustered up by Mr. *Camden*, I shall have contributed this one, by him and the rest omitted, which is, that by a received constant Tradition, *Romney-Marsh*, that large and spacious Level, containing (saith Mr. *Camden*) 14 Miles in length, and eight in breadth, was sometime Sea-land, lying wholly under Salt-water, and is therefore of some not improperly called the Sea's gift; which having (when time was) forsaken it, and withdrawn his wonted influence from it; the place thereupon became and continues firm Land. And if I may guess at the time and occasion of both that, and our *Canterbury Levels* recovery and riddance from Sea, I shall (for my part with submission to better judgments) be apt to pitch upon that of the Sea's breaking through, and in time working and washing away that *Isthmus* between Us and *France*. And then whereas before-

time



time *Romney Level* (which had and hath its *Stoures* too, or *Æstuaria* as well as ours) and this other not improbably (no high Lands as we see, interposing for impeding their conjunction) were but one and the same Level, and lay under the Sea's and Salt water's tyranny; now both the one and the other (the Sea having so much play and elbow room, than formerly by cleaving asunder the *Isthmus*) were rescued from it, and of an *Æstuary*, became such a rich and noble Valley or Level, as is second to none (I take it) in *England*.

To come at length to the fourth and last of our Queries, by what means the Sea once having its play there (at *Chartham*) this Creature comes to lye and be found so deep in the Ground, and under such a shelving Bank? My answer is, that supposing this with the rest of the Level or Valley once occupied by the Sea or Salt-water, that being a Creature which by fluxes and refluxes always is in motion, and thereby in time beating upon, and working itself into the bank, or rising ground there, might at length so far undermine, eat into, and loosen it, as to fetch down so much Mould or Earth upon, or over the place, as to lodge the Creature at so great a depth. Or else perhaps, the continual agitation of the Water, might in time force, drive up, and cast over it, that great quantity of Ouse, Earth and other matter under which it lay. By the way, it is observed that the nature of the Soil here and there, is such, so loose, supple, rotten and sandy, that merely of itself, it is apt to sink and fall in; as was lately experienced by a Saw-pit, digg'd hard by, which after a little time by the Earth's giving way on each side of it, fell in, and fill'd up itself \*.

\* See Fig. 1.

Remarks by  
Mr. Luffkin.  
n. 274. p. 925.

† Britannia. p.  
197.

‡ Ib. p. 208.

2. It seems to me, that these Teeth and Bones mention'd by Mr. Somner, might have been the Teeth and Bones of some Elephant, rather than of the *Hippopotamus*: and that,

First, in respect of the place; for, as Mr. Camden says † speaking of *Chilham* in *Kent*, of which this *Chartham* is a neighbouring Village, situate in the same Down, and on the same River *Stowr*, that it is a current report amongst the Inhabitants that *Julius Cæsar* encampt there, in his second Expedition against the *Britains*; and thence it was called *Julham*, as if one should say, *Julius Station* or House. It appears further, ‡ that *Rhatupia* (which whether *Richborough* or *Stoner* matters not) situate near the present *Sandwich*, was the place of *Claudius* his Landing in *Britain*; and that through this Down was his nearest passage to the *Thames* (is indisputable) whither he was going: So that 'tis highly probable, that during the stay, passing or repassing of these *Roman Armies* through these Downs, some one of their Elephants might perish or dye, and be buried there.

Secondly, By the Teeth themselves, for if you compare the Icons given by Mr. Somner, with the Descriptions of Dr. Mullins \* you will find them the very same, as to breadth and depth, &c. and their being *Molares*; for, says the Dr, these eight (which were all the Elephant had besides the two Tusks) were *Molares*, for he had no *Incisores*.

\* Anatomy of  
an Elephant.  
p. 40.

Thirdly and lastly, to solve that great difficulty (which obliged this Gentleman to imagine this Down to have been an *Æstuary*, that his *Hippopotamus*



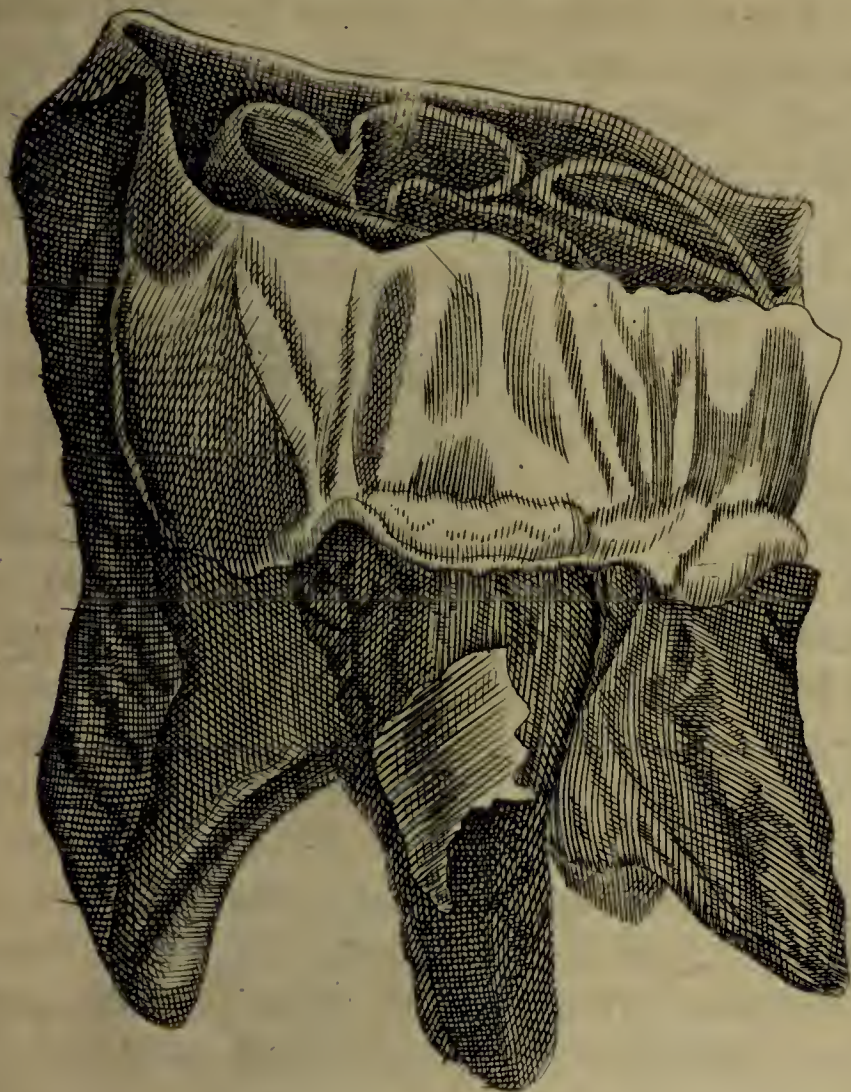


Fig. 1.









*popotamus* might therein dig its self a Grave, otherwise how should these Bones be found at such a depth? For who with reason (says Mr. Somner) can imagine, that any Land Creature could ever have had (at first) so deep a burial? But 'tis easily explained why these Bones should at this day be found at such depths, if we consider the Alteration or rising of the Valleys, by the continual washing down of the loose Earth or Soil by the Rains and Snows from the adjacent Hills, and by the annual rollings of the Grass, Sedge, &c. growing upon it: For proof of which take the following instance from \* Dr. Plott's *Staffordshire*, speaking of a Moss, &c. wherein there was found a Lump of Coins of *Edward IV.* of *England* (supposed to be lost in a Purse or Cloath, now rotted away) at 18 Foot deep, which being about 200 years since (that is, when they were found) whoever pleases to compute it, will find this Moss grew about one Foot in 11 Years, or one Inch *per annum*, and  $\frac{1}{12}$  *proxime*. Now it will be easily granted, that if this Moss grew or advanced itself above its former surface 18 Foot in 200 Years, then this Vale or Down might advance itself 17 Foot in almost 1700 Years.

\* Chap. vi. p. 48. p. 220.  
Chap. iii. p. 11, 12. Chap. vi. p. 45, 46, 47, 48.

VII. 1. I think it not amiss, to enforce this Argument, by considering, what must have been if this Hypothesis be true, and how it agrees with what we see an *Isthmus* had once been, where now is the Pass between *Dover* and *Calais*; the Great Seas, on both sides, must continually beat upon it, with a fierce impetuous Tide, twice in four and twenty Hours. The Northern Sea, between us and *Holland* (called *Oceanus Germanicus*) on the Eastern side: And the Western Sea, between us and *France*, (called *Oceanus Britannicus*) on the Western side. Which (in process of time) may well be supposed likely enough to wear away, or break thro' a narrow *Isthmus*. The Western Tide coming in fiercely between us and *France*, fretting on the Coast on both sides, must needs be supposed to bring with it a great deal of Earth, Sand, or Mud. But, being stopp'd in its Current by this *Isthmus*, did not deposit it (as might be thought) on the side of it, (which might strengthen it,) but found an opportunity of discharging itself on the spacious Level of *Romney-Marsh*; (which, as *Cambden* tells us, is fourteen Miles in Length, and eight in Breadth;) fretting that *Isthmus* as it comes along; and then (at standing Water, about the Tides recess,) letting it fall on that Level, and lodging it there: But then again, fretting that *Isthmus*, and the Coast all along, as the Tide returns, with a like force as it came in. Which gives us a fair account, both how that *Isthmus* might be washed away, and how that Level might be raised to that height it now is. For no man can doubt (who doth well know the Situation of the Place, and the Nature of the Soil) but that all that Level had heretofore been Sea. And even at this day, it lies so much lower than the Surface of the Sea at High-Water, that it would (much of it) be overflowed every Tide, if not defended (at a vast Charge) by *Dimchurch Wall*, for many Miles together. Whether it had a like opportunity of such an In-draught (and in what proportion) on the *French Coast*, I cannot tell. But, that this is the condition of *Romney-Marsh*, no Man doubts.

of the Isthmus between Dover and Calais, by Dr. Wallis. n. 275. p. 967.



The *Northern* Sea, (between us and *Holland*) must, in like manner, have beat on the *East* side of that *Isthmus*, with a like impetuous Tide, twice in four and twenty Hours. But, being there stopp'd in its course, would have the like opportunity of discharging it self on the Coast of *Holland*, (as the *Western* Sea on *Romney-Marsh*.) Whence it is that *Holland* and *Zealand*, which (by the consent of all) is judged to have been once Sea, is now raised, thirty or forty Foot higher than it had once been. And the same *Northern* Sea, which (on this account) hath so large an Inlet (Eastward) on the Coast of *Holland*; would (Westward) insinuate it self likewise on the *English* Coast, wherever it might find low Grounds. Which is the case of this large Valley, where now runs the River *Sture*, *Stoure*, or *Esture*; (which name it is supposed to have taken from the Corruption of *Æstuarium*;) for more than twenty Miles, (and nothing appears why we should think it had not so done,) entering at the low Grounds near *Sandwich* (close by that *Isthmus*) and running up that Level (by *Canterbury*, *Chartham*, *Chilham*, and so forth) as far as *Ashford* or further. Which Valley had once been much deeper than now it is. For it seems, that even at *Chartham* (which is now twelve Miles from the Sea) the Ground is raised at least seventeen Foot, and the Soil, at that depth, found to be of a like condition, as where the Sea is known to have been; and nearer to the Sea, it may well be presumed to have been yet deeper. Which is confirmed by the Reliques of this Marine Animal there found, and by Anchors, and Shells of Fishes, found elsewhere in the Borders of this Valley, at a great depth under Ground.

Now, that the Sea may thus raise the Ground on such In-draughts, by Sand, Earth and Mud, brought in and lodged there at every Tide, is not at all unlikely; for we see the same at this day. Particularly, in the Isle of *Oxney* (near adjoining to *Romney-Marsh*) there was a low Level, oft in danger of being overflowed by the River *Rother*. But somewhat more than three-score Years ago, the Sea being let in, hath raised that Level very considerably, by bringing in, and lodging there, a considerable deal of Earth and Mud every Tide. But withal, it hath so fretted the Chanel by which it enters and goes out again, that the Chanel by *Rye*, which (within my Memory) was so shallow near (what was called) *Kent* Bridge, that Men and Women were wont to ride thro' it: But now (by the Tides entering and returning) that Bridge is long since swallowed up, and the Chanel become so broad and deep, that a Vessel of good Burden might ride there at Anchor. A fit resemblance of the Seas fretting this *Isthmus*, and filling up the *Æstuaries* on both sides of it. The like, in good measure, is to be seen at (what they call) the *Dogger Sands*, which is a Bank of Sands, lying (obliquely) from about the Coast of *Norfolk* (if I do not mistake) toward the Coast of *Zealand*, or *North* part of *Holland*. Which is the place where the *Northern* and *Western* Tides (since the Rupture of the *Isthmus*) do now meet, and do there (at still-water, for about an Hour, or at the turning of the Tide) deposite the Mud and Sand, which (by their rapid motion) is both ways brought thither. Which is supposed to be the true cause of that Sandy Bank.



Bank. Whether this, in tract of time, may there form a new *Isthmus*, (if the World last long enough) I cannot say. But I am apt to think that the former *Isthmus*, (if the Tides had stopp'd there, and had not found those In-draughts, on which to lodge what it washed from thence) might have continued, and been more strengthen'd, by what (upon the Return of the Tide) would daily be lodged there. And upon this account (I think) it is, that the *Isthmus* at *Corinth*, tho' beat upon by the two Seas (which give it the name of *Bimaris Corinthus*) is not thereby destroyed, because there are not such Tides to wash it away; nor such In-draughts, on which to lodge what should be washed from thence.

But the case is much otherwise with this *Isthmus* of ours: Where are all things to countenance this *Hypothesis*. The steep Cliffs at *Dover*, and those at *Calais*, answering directly the one to the other; and appearing to view, as if, that between them, had been violently torn away. And the Sea between them (even at this day) being much shallower at that Place than on either side of it (as *Cambden* doth well observe,) which are strong Presumptions, that there had been formerly such a conjunction.

The greatest doubt in this case is, that there is no History extant (that I know) which takes notice of such an *Isthmus*, or such a *Rupture*, in this place, which being a thing remarkable, might have been thought worthy to be reported. Which yet need not be thought very strange, considering that we have no particular account of the *British* Coast (which might determine this Question) older than the *Romans* access hither with *Julius Cæsar*: Whereas this might have hapned many hundreds of Years before that time, when tho' the Island might be known, yet not the particular Coastings of it to the *Greeks* or *Latins*. But I have this further to say. *Plato* \* tells us a story (as of a thing which had hapned some Ages before his time, and which at that time was in a manner generally forgotten) of an Island somewhere in the *Atlantick* Ocean, which by a Deluge and Earthquake (in the space of a Night and Day) was destroyed, and swallowed up by the Sea; whereby that Sea (formerly Navigable) was for sometime become unnavigable or unsafe, by reason of the Mud and Reliques of that absorpt Island. Which seems to me very applicable to the Rupture of this *Isthmus*: Whereby this Island was not indeed wholly destroyed; but was broken off from the Continent, to which it was before united. And, upon such an accident, the Sea must needs be disturbed, and put out of its course, and rendred unsafe for passage, before it came again to be settled. For, tho' the first Breach might be made in the space of one Night and Day, we cannot suppose the whole Bulk of it, when once broken, was presently carried smooth away; but first the top and upper part of it (in a Day and Night's time) and afterwards the lower parts of it by degrees. Which would render that Sea, if not quite unpassable, at least troublesome and unsafe.

And if in some circumstance, this Narration chance to differ from the matter of Fact, as calling the *Rupture* of this *Isthmus*, the *Subversion* of an *Island*, this must be allowed in the Narrative of an old Tradition from hand to hand; for as such it is there brought in. For *Plato* doth there introduce

\* Ed. H. 1  
Steph. p. 25.



*Critias* (then an ancient Man) telling a Story, which (when a Boy ten Years old) he had heard from his Grandfather (who was ninety Years of Age) of what *Solon* (long since dead) had told him; namely, that an *Ægyptian* Priest had (long before) told *Solon*, that it did appear from some old *Ægyptian* Records (of which the *Greeks* had no knowledge) that such a thing had hapned, in an Age so long before, as in comparison of which *the Greeks were but as Children*. And all this Tradition (thro' so many hands, and at such great intervals of time) is, at every step, reported from the Relator's present memory. And 'tis very possible, that some one or other of these Relators might so far mistake, or misremember, as to call that a *Dissolution* or *Disappearance* of an Island (*ἡφάνισθη*;) which was but a *Tearing* of it from the Continent. It serves however to the present purpose, if at least so much of the Story be true, *That long before Plato's Time, there had been some such Dissolution or Rupture of an Isle or Isthmus, somewhere in the Atlantick Ocean, (that is, in the Northern Sea) of which there were some symptoms yet remaining in Plato's Time.* For, this being admitted, it is as applicable to the present case (as to any we know) of which there are so many Symptoms yet remaining to this day.

\* *Atlantica*.  
Chap. vii. §.  
8. p. 293.

I know, that *Olaus \* Rudbeck* doth endeavour (in favour of his *Sueonia*) to put an allegorical Sense upon this whole Passage. But I see not why it may not be understood in a plain literal sense, as a true matter of Fact, (tho' perhaps a little disguised, as was wont to be the fashion in that Age in relating old Stories;) and is very consistent with all that *Rudbeck* cites out of *Plato*, in that whole seventh Chapter of his *Atlantica*. For the name of the *Atlantick* Sea (wherein this Island is said to be) was not then (nor is now) confined to the Coast of *Sweden*, but extended as far as the *British* Island, and much farther. And when *Rudbeck* tells us out of *Plato*, that the whole *Atlantica* was as big as *Libya* and *Asia* (which whether meant of either of them singly as *Rudbeck* understands it, or of both together, as the Words seem to import, *ἅμα Λιβύας ἢ Ἀσίας μέγιστον*, I will not contend;) we cannot suppose it to be *Plato's* Meaning, that this whole Region was swallowed up; but rather some small part of it, from whence perhaps the whole might take its Denomination. And tho' he tells us (from another Writer) that it was *five Days Voyage* from the *British* Island, to (that part of) his *Atlantica*, where for *thirty Days together the Sun doth not set*; this hinders not but that the *British* Islands may be part of the *Atlantick* Region, tho' so far distant from the utmost *Northern* Cape of it.

This Author tells us, that this *Æstuary* (from *Sandwich* to *Ashford*) might perhaps flow so much further, as to meet with that *Æstuary* on *Romney Marsh*, and (both being conjoyned) become one Level. There is, I think, about three or four miles distance, between *Ashford* and the nearest part of *Romney Marsh*. How the intermediate Lands be qualified, I do not well remember: But, if this be admitted, that the two *Æstuaries* (that of *Stoure* and that of *Romney Marsh*) in former times may thus have met: This opens a new Scheme, of which before we were not aware. For then we must say, that the two Tydes (that from the North and that from the West) which now

meet



meet at the *Dogger Sands*, did then meet at the confluence of these two *Æstuaries*. And then (as was but now said of the *Dogger Sands*) bringing (on both sides) Earth, Mud and Sand to this place, and lodging it there; might first form an *Isthmus* there, and (by degrees) fill up those *Æstuaries* on both sides. Mean while, washing away that *Isthmus* between *Dover* and *Calais*, and opening a new passage as now it is. There be many other *Æstuaries* in *England*, where the Sea now enters a great way into the Land; and, how far it might have entered further in former times, who can tell? As that Sea by *Bristol* between *Wales* and *Cornwall*: That of the *Humber* between *Yorkshire* and *Lincolnshire*: And we may reasonably think, that the *Washes* and the *Fenns* in *Lincolnshire* may have heretofore been Sea, or overflowed by the Sea at High Tydes: And that of the *Thames* (between *Kent* and *Essex*;) which now flows (above *London* and *Brentford*) within a mile of *Kingston* (at Spring-Tydes;) it may perhaps seem too daring, to think it may formerly have flowed as far as *Oxford* (between *Shot-over Hill* and *Foxcomb Hill*) and so onward toward *Wallingford* (in the *Romans* time called *Galena*;) but there is this to countenance it, that (if I be not much mis-informed) there be frequently found (in our Stone-Quarries and Gravel-Pits) about *Oxford*, Fish Shells, and even the Bodies of Fish Petrified, at great depths under Ground. And there have been (no doubt) and now are (in *England*) many other *Æstuaries*, Creeks or Arms of the Sea (entering a great way within Land,) some whereof may be (in a manner) filled up, and become firm Land; others much narrower, shallower and shorter, than in former times they have been. For it is the nature of *Æstuaries*, where the Tydes flow in, to leave behind them, at their Return, much of Mud Oase or Sleech (as they call it,) which doth in time come to be firm Land.

At *Hythe* in *Kent* (which is one of the *Cinque Ports*) there was (in our Fathers time) a Convenient Harbour for small Vessels; which is now swarved up. Several attempts have been made to recover the Harbour, but with small success. For when (with great Labour and Charge) they have (in some measure) opened it, it hath soon been filled up again, by what the Sea casts up. And whoever considers the vast quantity of (what they call) *Beach* (that is, a vast multitude of small loose Stones and Fish-shells, cast up by the Sea at *Hythe*, *Lyd*, and elsewhere on the Coast of *Romney Marsh*, (for divers miles in Length and Breadth, and to a great depth,) will not think it strange, that a *Creek* or *Æstuary* should come in time to be filled up and become firm Land. And in many places of this *Beachy* ground, where (within the memory of persons now living) nothing was to be seen but such loose Stones and Shells (to a great depth,) it comes (by degrees) to be covered with Earth, and becomes Pasture Ground. On the contrary, that what was formerly Firm-land, may be so destroyed or washed away, as to become Sea, is evident from (what they call) the *Goodwin-Sands*, on the Coast of *Kent* which is said to have been the Lands of Earl *Goodwin*; but lost by an Inundation about the time that *Tenterden Steeple* was built, (which gave occasion to that Ironical Proverb of things contemporary, that *Tenterden Steeple was the cause of Goodwin Sands*.) The occasion of such different effects, depending



pending on the different situation of the Shores and the setting of the Tydes; so as to wash off from one place what it lodgeth on another.

n. 276. p.  
1922.

I observe, that the River in *Essex*, and that in *Kent*, (near which the Bones were found,) are (both of them) named the *Stowr*. Which, whether it be a corruption of the Latin *Æstuarium* (as Mr. *Somner* conjectures;) or, of the British *ys-dwr* (that is, *the Water*,) I will not dispute. And, That the Bones were found (in both places) much at the *same Depth*, (about 16 or 17 foot under the surface of the Earth;) which therefore may (probably) have been lodged (in both places) much about the same Time: And, perhaps, when the Emperor *Claudius* brought his *Elephants* into *Kent* and *Essex*; as Mr. *Luffkin* intimates out of *Dio Cassius*.

I observe also, that those Petrified Bones, in both places, were found in *Gravelly grounds*, (as are those Petrified Shells, and Bodies of Fishes, in Gravel Pits and Stone Quarries, near *Oxford*.) How far the Steams, Fumes, or Fluors of the Earth, which contribute to the formation of Stone or Gravel, may conduce to the Petrifying of these Bones, Shells, or other Bodies; I leave to the consideration of inquisitive Naturalists. And, Whether the Impregnation of such *Steams*, may not *Swell* such Petrified Bodies, to a larger Proportion than before they had. Like as we observe Wood (and other like Materials) in a Moist Air, to Swell; by the Distention of their Pores, upon the intromission of Moist Particles. For I take all Petrifications to be made, either by *Incrustation*, or *Intromission* of Stony Particles.

And I well remember, that (many years ago) at *Moldash* in *Kent*, (not far from *Feverham*) on some High Grounds, and very Stony, (which used to be sometimes Pasture, and sometimes Plowed,) I have observed divers *Oyster shells* (Petrified, or partly so,) much Larger and Thicker, than the ordinary Proportion of Oysters in those Parts, and very weighty; which Oyster-shells might have been purposely thrown there long before, as being reputed a good Manure for Land; and might have been there Impregnated with like *Halitus*, *Effluvia*, as are the Numerous Stones on those Lands. I have known the Inhabitants, heretofore, have used to cause the Stones, in those Lands (because they are very numerous) to be gathered up, and carried off the Lands, by Cart-loads, to make more room for the Grass to grow. But of later years, they forbear (I have been told) so to do, as thinking the Warmth (or somewhat equivalent) of those Stones, is rather an Help than Hinderance, of the Earth's Fertility. Of which, I shall not adventure to deliver an Opinion; but refer it to further consideration.

But I see not why we may not think, the *Stowr* in *Essex*, and the *Stowr* in *Kent*, to have been (both of them) *Æstuaries* of the *Northern Tide*; before the Rupture of that *Isthmus* between *Dover* and *Calais*: (And the like of the River near *Malden*, and other small Creeks on the Coast.) Though not so Great as those of *Humber* and the *Thames*: (which were then *Æstuaries* of the same Sea:) as are many others on the Coast of *Scotland*. I say, *Before that Rupture*: For since that Rupture, the case (as to the *Thames*) is somewhat alter'd. For the Western Tide (between Us and *France*) which was then stopp'd at this *Isthmus*, doth now flow on (thro' that *Fretum*) beyond



beyond the Mouth of the *Thames*, (as high as the *Dogger Sands*;) which doth therefore supply the *Æstuary* of the *Thames*, which was formerly furnished from the *Northern Sea*. And these smaller *Æstuaries* might sooner be swarved up (by what every Tide lodgeth there) while those Greater *Æstuaries*, are but shortned, and become narrower, than they had formerly been. And as to the *Thames* in particular, it seems very evident (if we consider their Situation, and the Nature of their Soil,) that much of the Low Grounds (in *Kent* and *Essex*) on both sides of the Mouth of the *Thames* (adjacent to the Sea) had formerly been Sea, (as well as that of *Romney Marsh*.) And when the Mouth of the *Thames* was so much wider, no doubt but it flowed much further than now it doth. And, how far, who can tell?

It may perhaps be objected, that the small Rivers now remaining, in the bottom of these Vallies, which may have been supposed (in former times) to have been *Æstuaries*; do now run more Wriggling (with more Turnings and Windings) than do these Vallies. But this need not at all to seem strange, when as we may daily see the same, in the bottom of a Muddy Ditch (or Water-couise) when the Water is almost drained off, the Mud yet remaining soft: the little Water, yet remaining, will work out of it self (amidst the Mud) a Wriggling passage (according as the Mud will more or less give way) much more Crooked than was such Ditch when full of Water. And the like must needs happen in the (gradual) Draining of such *Æstuaries*, according as the (soft) Earth will permit. Which Crookedness will continue, when the Banks on both sides do (by degrees) grow firmer.

As to what I say concerning the Isle of *Oxney*; I take it to be thus. If we look in the more Ancient Maps of *Kent* (older than the Year 1640) you will find, that (what we call) the *Isle of Oxney*, was then but a *Peninsula*; being (by a small *Isthmus* or neck of Land at the North-East corner of it) continued to the rest of the Country: And the Tide from *Rye* to that place (which now flows straight onward on the North side of the Isle) was there stopp'd by that *Isthmus*, and did wheel about on the South side of it: Or rather the River *Rother*, did (from the North side of the Island) wheel about by the South side (to that Eastern corner) and thence (by the Chanel) to *Rye*. While things were in this state; divers Moorish or Marsh-lands, adjoining to the River *Rother*, were oft in danger (upon great Rains) to be Drowned. But so it once hapned (by what accident I know not) that this Drowned Land had unexpectedly (in a Night's time, or little more) discharged itself on another Level, somewhat lower than itself. Upon which Indication, it was thought Advisable (by cutting that *Isthmus*) to allow those Waters (on the North side of the Island) a straighter passage toward *Rye*; and to let those Lower Grounds (for some time) to lie under Water (paying the Rent of them) till such time as (by intronitting the Tide) they might be somewhat heightned; and then timely recover'd.



Of the same  
by Dr. Musgrave. n. 352.  
p. 589.

2. Posita Chersoneso Britannica, utrum excedi potuerit : Deinde, utrum exesa fuerit, edisseram.

De priori propterea dicendum, quod à Vossiorum altero, strenue negatum sit, unquam, ubi hodie Fretum est, fuisse Chersonesum : & quidem ideo negatum, quoniam, illo sentiente, nihil ei deterendæ dividendæque par invenitur. Ut Taprobanam (Insulam Ceylon) à vicina continente non avelli probet Vir Clariss. [Otio (a), inquit, abundant, qui istiusmodi Ægyptiorum fabelli, jam millies productis, totiesque recoctis, aurem commodant. Quam constans & tenoris sui observans sit rerum natura, patet è Bosphoris, omnibusque omnium terrarum Fretis : Iis cum præcipue Marium & ipsius Oceani vis semper incubuerit, eadem tamen ubique à tot annorum millibus & ab ipso, ut verisimile est, rerum exordio, servaret intervalla. Currant licet, ac recurrant Undæ, allatrent undequaque Fluctus, fortius est Elementum quod resistit, quam quod oppugnat. Exesi Scopuli ac vasta maris antra, satis ubique ostendunt, quantum Oceani impetus lapsu seculorum possit efficere : verum hæc ipsa quoque quid non possit efficere Oceanus, multo clarius ostendunt. Hæc Isaacus.

Cum vero non de Taprobanæ solum Freto commentatur, sed de Fretis in universum, & quidem Argumento à constante & tenoris sui observante rerum natura accepto, videamus quam hæc cum Oceanis & Freto nostris conveniant, & in iis quam constanter agat Natura.

Oceani Britannici, prout nunc dierum est, cum latitudo tum profunditas investiganda, ut ex iis de prisco seu Freto, sive Sinu, possimus sententiam ferre. Ut autem eas comperiamus, adeunda est Tabula Halleiana, sui generis omnium accuratissima. Ea docemur, in Oceano Britannico, ubi Terrarum hiatus hac illac amplissimus est, à veterum Ocrino (Lizard-Point) ad Insulam ei oppositam Ushant, unum esse gradum cum semisse, id est, Leucas quasi triginta, sive milliaria 90. Hinc Oceanus se in orientem parum adducit, at multo magis ubi Promontorium in eum procurrit Normannicum : ibi enim est dimidio adductior ; cum inter Peverel-Point, & Cape de Hague è regione sita, Leucarum Anglicarum quasi 16 distantia sit. Tunc se iterum effundit, ubi Sequanam recipit : at brevi in arctum agitur, inter Beachy-Head & Cape St. Vallery. Dein paulatim angustior, fastigiat se mollior usque dum in Fretum contrahitur, inter Ness Anglorum & Gallorum Blackness, non amplius octo Leucis, id est 24 milliaribus patens. Terræ tunc aperiuntur longe lateque vastissimæ, & spatium Mari faciunt Germanico. Hæ sunt Oceani Fretique Britannici diversæ latitudines ; quibus apparet, eas si non continuo, tamen adeo rara tamque exigua cum ampliatione minui, ut argumento nostro nihil inde queat derogari. Ita enim Oceanus contrahitur, ut qui initio, seu Faucibus ejus Britannicis, Leucas triginta, sive Milliaria præterpropter nonaginta latus sit, post Leucas 153 circiter, sive Milliaria 460, (quæ hujus Oceani longitudo est) ad 24 Milliaria contrahatur ; id est ad primæ latitudinis partem quasi quartam.

(a) In Notis ad Melam.



Profunda hujus Oceani altero jam loco sunt expiscanda, & quidem optime beneficio ejusdem Tabulæ. In ea dividitur Oceanus *Britannicus* una cum Freto, in Columellas, numero decem, oblongas. Harum singulæ latera sunt ex circulis Meridianis accepta; quæ cum in plano ducta sint, videntur esse recta. Columellæ terminantur adversis *Galliæ Britannique* litoribus: hoc est, Lineis huc illuc curvatis in litorum morem.

Incipiamus à prima in occidente, quæ & longissima Columella est: & (præmisso quod, *Hiberniam* & *Galliam* inter, Oceanus orgyias altus sit in locis compluribus octoginta; uti paulo ulterius in aperto Mari, 100, 120, 140) notandæ sunt in prima Columella *profunditates* omnium altissimæ; quæ decies exploratæ se habent, ut 58, 66, 63, 65, 58, 65, 68, 60, 60, 60. quæ *profunditatum* Summæ faciunt 623 orgyias. Eæ per decem, i. e. *profunditatum* numerum, divisæ, mediam earum *profunditatem* ostendunt esse 62. In Columella altera, decem altissimarum media *profunditas*, simili modo investigata, est orgyiae 51. In tertia 51. In quarta 40. In quinta 43. In sexta 40. In septima 36. In octava 37. In nona 33. Post nonam Columellam, cum Oceanus in lævam flectitur, & obliquus in Fretum definit, accipiam illud ut Terris interjacet, in *Britannia* locis appellatis *South-Foreland* & *Hastings*, in *Gallia* *St. Vallery* & *Estaples* inclusum. Hic *profunditatum* decem media est 30. In Freto angustissimo 16: quæ ad profunditatem mediam in prima Columella, est, ut 16 ad 62; id est, ut 1 ad 4 fere; & ad altissimam profunditatem *Galliam* inter *Hiberniamque*, ut 16 ad 80, i. e. ut 1 ad 5: ad altissimam in aperto Mari, ut 16 ad 140; i. e. ut 1 ad 9 fere.

Qua proportionem minuitur altitudo Maris, ea crescit Terræ Mari subiectæ acclivitas; & est illi in *ratione inversa*: quæ utique propositio, si non ex omni parte vera, (propter orbis figuram minime rotundam) tamen adeo veræ proxima est, ut argumentationi nostræ sufficiat. Est ergo Terra, in Freto nostro angustissimo undis subiecta, quam in Oceani *Britannici* faucibus, orgyias 46, id est pedes 276 altior; & quam Terra, *Galliam Hiberniamque* inter, Oceani subiecta, orgyias 64, sive pedes 384 altior; & quam Terra, aperto Mari subiecta, 124 orgyias, sive pedes 744 altior. Vide quanta sit Terræ ab alto Mari ad Fretum acclivitas; eaque ut ex calculo prædicto patet, fere continua. Hæc est Oceani *Britannici*, tam in illius Latitudine, quàm Profunditate contractio.

Age, nunc tendamus ultra, velis expansis, in Oceanum *Germanicum*: Hic Mare subito patentius, sic, ut etiam profundius: quod inter Promontoria *North-Foreland*, *Orfordness*; Oppida *Galetum* & *Ostendam* interfluit, decem maximas habet mensuras, quarum media 24 Orgyias cum  $\frac{4}{5}$  continet: quod inter *Orfordness*, & *Yarmouth*, *Texellam* & *Ostendam* est, maximas decem mensuras habet, quarum media 25 Orgyias cum  $\frac{1}{5}$ . Quicquid ultra est, Terris hinc ad occidentem illinc ad orientem se retrahentibus, vastissimus est Oceanus, in quo mensuræ sunt ab orgyis 45 ad 50 numero quamplurimæ. Hæc a Freto *Britannico*, tam in oriente quam occidente, Terræ declivitas (quæ a Maris altitudine utrobique aucta patefit) omnino probat, in ipso Freto jugum esse Terræ excelsum, acutum; quod cum hodie non multum infra Maris superficiem.



ficiem esse reperiatur, olim se emergere, hoc est *Chersonesum olim hic fuisse, monstrat.*

Alia sunt duo, quæ cum in hac re momenti sint immensi, tenore tum minus certo, & natura minus sunt constanti; quandoquidem a Maris motu & ventis accepta. In refluxu Maris Aquæ nunc quiescentes incubant arenæ; nunc eam molliter præterlabuntur. In æstu mitiori, Litus & ima Rupium blandissime lambunt, tenerrime osculantur. Fervente vero æstu, res omnino alia est: Aquarum Fremitus auditur, Fluctus cernuntur, & se non parum attollunt. Nihilominus sine multa strage, terrisve aliquot annorum millibus exesis, hæc omnia posse fieri, cum *Vossio*, cogitandum est.

Sin æstuant Mari, quod altero loco dicendum est, Ventus superveniat: papæ! quoti, quantique Fluctus advolvuntur! *Alpes* existimare licet *Crystalinos*, nisi quod cito diffuant. Tanta vis Aquarum ex Oceano occidentali in *Britannicum* immittetur, & tanto impetu, quantus in universo Terrarum orbe rarus inveniat; imo quantus ab ipso rerum initio rarissime. Oceani *Britannici* tum brevia, tum angustia, continuo pæne (quod ostensum est) crescentes, faciunt, ut Aquæ sic impulsæ mirum in modum eleventur, & in Isthmum (quem argumenti gratia fuisse damus) arietent, ita ut ab iis Isthmum exundari, deteri, ablui; sicque Insulam fieri *Britanniam* non videatur *ἀδυνάτων ἐν*; verum e contrario factu probabile. Quantæ Ventorum, at præcipue Zephyri Caurique virtutes sint, in cogendo impellendoque hoc Oceano *Britannico*, paucis expendam, a Doctissimo viro *Rad. Bohun*, (*Novi olim Collegii Socio*, qui de *Ventis* omnium eruditissime scripsit) hac in re adjutus.

Adeo sævus, horribilis, iracundus sæpe Zephyrus, Vires in Oceano, qui *Europam* & *Americam* vastus interjacet, acquirens, & in amplissimo hocce campo recensens, vix concipi potest, quanto *Britanniæ* *Galliæque* oras impetu invadat. Exploratissimum enim est, in hæce oras eum communiter anni plus dimidio flare, (quod jam olim a *Julio Cæsare* notatum) & flatu eas sævissime verberare: maxime autumno, a quo sumunt originem Tempestates *Idiomate nostro dictæ* [*Michaelmass-Storms*] eumque adeo interdum sævire, ut si cum æstu fervente jungi Ventus his acciderit, tam Oceanus *Britannicus*, quam Fretum *Sabrinianum* immane quantum augeantur. *Sabrina* vastissime turget. *Uzella* longe lateque *Somerjetensem* Agrum exundat. Mirum ab hisce Cataclysmis quantum \* mea patria perpeffa est. Continuatur æstus ad usque *Tewkesbury*, id est milliaria magis ducenta. Apud *Chepstow* Aqua pedes interdum octoginta assurgit. Idem fere dicendum de Oceano *Britannico*, Venti ejusdem viribus elato: nisi quod hic, *Chersoneso* jam effracta, liberius Aquæ moveantur, non adeo sistantur, non tantum eleventur; quæ utique Aquarum libertas ante *Chersonesum* abruptum, nequaquam adeo magna esse potuit. Hac igitur de causa [*Zephyro* nempe, *Cauro*, sive alio Ventorum aliquo, Maris æstui superveniente] Oceani *Britannici* Undam in Isthmum validissime impingi, & ab illis primùm ejus superficiem, quæ ex *Silice* & *Calce* (prout hodie *Terræ* e regione oppositæ) constabant, ablui; deinde Isthmi quod reliquum erat, spatio bis mille annorum & eo amplius, Aquæ fluxu refluxuque ad 16 orgyias, quæ hodierna Freti hujus (quod diximus) altitudo est, atteri; credibile verissimile est.

\* Devoniam.



Tantum abest, ut *Vossio*, Fretorum perpetuitatem a naturæ in operibus suis *constantia* tenoreque eodem arguenti, fidem habeamus; ut e contrario Fretum hocce nostrum illius *inconstantia* deberi, lubens agnoscerem. Vir ille clarissimus, naturæ usitatum agendi modum unice respiciens, *extraordinarium prætermisit*; qui tamen, in raris hujusmodi effectis, potissime videtur respiciendus. In Freto *Siculo* considerando, ejusque diducendi modo investigando, quis Ignis subterranei supra modum erumpentis, tamquam Causæ hac in re probabilis, non meminerit? nisi istam *Catanensium ἀτοπίαν* consecutus, qui (tradente *Alphonso* (1) *Borello*) post Eruptionem *Ætnæ* diu intermissam, Ignem ejus immodicum ne semel quidem unquam fuisse, satis insulse putavere. Ut Vento nihil inconstantius, sic ad Fretum hoc aperiendum (posito causarum apparatu cætero) nihil conducibilius: & cum eo res deducta est, *fortius elementum esse quod oppugnat, quam quod resistit*, (aliter quam *Vossius* statuit) omnino probabile mihi videtur.

Non alienum erit hic Inundationum aliquot exempla, uti revera fuere, in medium proferre; quibus abunde patet, Terræ faciem frequenter obrui, & ab iis non parum mutari. Hic autem nihil necesse est, ut *Helicen* & *Burin*, *Achaia* Urbes adeamus: de quibus tanquam magnarum Inundationum argumentis, (2) *Ovidius*, & diu ante illum (3) *Aristoteles*. Gravissimas fuisse Oceani nostri, tam *Germanici* quam *Britannici*, satis ostendunt Historici Geographique.

In *Zeelandia* (4) Insulæ undecim, & in iis Oppida & Pagi (quorum hodie summitates. aliquæ refluxu Maris in conspectum veniunt) numero tercentum (5) obruebantur.

Anno 1014. [*Mare Litus egreditur III. Cal. Octob. & in Anglia Villas quamplurimas innumerabilemque populi multitudinem summersit.*] (6) *Simeonis Dunelmensis* Historia de Gestis Regum Anglorum. De hac, ut opinor, Inundatione videatur etiam Chronicon *Job. Brompton* (7).

Anno 1099. [*Tertio Non. Novemb. mare Litus egreditur, & villas & homines quamplures, Boves & Oves innumeras demersit*] *Sim. Dunelmensis* (8) Historia.

A. D. 1176. [*Mare extra fines in Anglia erumpens multos in Hollandia homines & pecora absorbuit, & quasi post biduum furore sedato in semet ipsum rediit.*] Chronicon *Johannis Brompton* (9).

(1) In Libro de Incendiis *Ætnæ*. p. 117.

(2) Invenies sub Aquis, & adhuc ostendere nautæ.  
Inclinata solent cum mœnibus oppida versis.

1 *Metam. Lib. 15.*

(3) Τὸ ὃ ἀνάλογον συμπίπτει τέτοις καὶ ἐν θαλάσῃ. Χάσμα γὰρ γίνετ' θαλάσσης, καὶ ἀναχωρήματα πολλάκις, καὶ κυμάτων ἐπιδρομαί, ποτὲ μὲν ἀντανάγκω ἔχασαι ποτὲ δὲ πρὸς αὐτὴν μόνω, ὥστε ἰσορρεῖται καὶ ἐλίκω τε καὶ βρεῖαν. *Arist. de Mundo.* (4) *Heylin's Geogr. L. 2.* In Belgio. (5) *Laet. Descriptione Belgii*, p. 124. (6) Apud Historiæ Anglicanæ Scriptores X. p. 171. (7) Apud eisdem, p. 892. (8) Pag. 224. (9) Pag. 1117.



Insolitam maris inflationem & commotionem Anno D. 1250. factam, tradit *Matthæus* (10) *Parisiensis*. [Unde Mare perturbatum fines solitos pertransiens, tam horribilem mugitum cum fremitu edidit, ut per remota Terræ spatia, non sine stupore audientium, reboaret. Visum est etiam sub opaca nocte ipsum Fretum quasi accensum ardore, & Fluctus Fluctibus conglomeratos dimicare. Apud Winchelese plusquam 300 domus cum quibusdam Ecclesiis per Maris violentum ascensum sunt submersæ.]

Anno 1251. inquit idem (11) *Matthæus* [In Frigia (quæ Friselandia appellatur) Aqua Diluvium fecit particulare, occupans Terræ illius spatium itineris circiter septem dierum. Post 40 dies ille damnosus Fluctus in locum suum remeavit.]

Anno 1286. [Ingruente fortissimo Vento, flante de partibus Orientis, qui & *Eurus* dicitur, & fluxu Maris super provinciam Hollandiæ terribiliter invalescente; prævaluerunt Aquæ Maris, adeo ut Fossata, quæ Terram ipsam & Mare disterminant, inopinatus quam credi poterat, transgrederentur; posuitque Terram fructiferam in salsuginem tam repentinus Maris impetus; qui per indigenas nullatenus poterat obviari: & maxima pars S. Botolfi submersa, hominumque & pecudum inæstimabilis periit multitudo.] Ita *Chronicon Tho.* (12) *Wikes*.

DE Hollandiæ Inundatione sic *Hadrianus Junius* (13) in *Bataviæ Historia* [Quadringentis abhinc annis inaudita illa Inundatione quæ universam Hollandiæ faciem longe lateque operuit, obstructo fluminis (Rheni) cursu, steriles arenarum colles Litus occuparunt. Mare, Terras, ipsamque Litoris oram attrivit.]

Anno 1404. quo beatissimus noster *Wiccamus* obiit, [Tanta repente ruptis limitibus irrupit Aquarum influentia in Cantio, quanta nunquam fuerat illic ante visa, qua submersa sunt animalia numero & pretio excessivo: nec solummodo deflevit Anglia damna talia, sed ut fertur, Zelandia Flandria & Hollandia, per Undarum excrementa, innumerabilia sensit dispendia eo anno.] Hypodigmate *Neustriæ* per *Tho.* (14) *Walsingham*.

[Regnante *Edwardo I.* cum Oceanus ventorum violentia exasperatus, hunc (Cantii) tractum operuisset, lateq; hominum, pecorum ædificiorumque stragem dedisset, & *Bromhill* viculo frequente pessundato, etiam *Rother*, qui hic prius se in Oceanum exoneravit, alveo emovit, ostiumque obstruxit, novo in Mare aditu compendio per *Rhiam* aperto] *Camdenus* in *Britanniæ Cantio*.

Quid quod *Tungros*, oppidulum *Leodiense*, a Mari pene centum milliaria jam remotum, Mare quondam adluere opinati sunt Viri doctissimi, argumento non uno persuasi (15).

Neque nostra ætas caruit hujusmodi Exundationibus: Narrant *Novellæ Feb. 27. 1713.* in *Effexia*, plura Terræ jugerum millia, per milliaria aliquot, inter *Barking* & *Purfleet*, everfis obstaculis, Maris influxu obrui.

Hæc de Oceani Germanici exundationibus: *Britannici* nostri, & *Sabrinæ*, neque pauciores, neque minores sunt. Enimvero vidimus ætate nostra Isthmum, uno eodemque *Pededri* fluxu & refluxu (Terræ superficie prius ab

(10) Pag. 535. Ed. *Waisiana*. (11) Pag. 549. (12) Pag. 114 (13) Pag. 196. (14) Pag. 564 Ed. *Francofurt MDCIII*. (15) *Verstegan's Antiquities*, pag. 102. *Ray's Physico-Theological Discourses*, 1693. pag. 169.



Agricolis semota) dilui, fluviumque veteri cursu relicto novum acquirere: hoc, inquam, unico fluvii istius æstu factum vidimus, nullo auxilium præbente vel Undas adigente Vento.

Sabrinæ fluminis impulsu fieri probabile est Exundationem illam, qua in Agro *Monumetensi*, Parœciæ N<sup>o</sup>. 26. A. D. 1607. mense *Januario* Aquâ obruerentur: Cujus eodem Anno publicata fuit (16) *Historiola*.

Johanne rerum *Anglicarum* potito [*Subita & improvisa Aquarum Inundatio pluribus in locis per Angliam facta est, unde plures homines submersi sunt, & domus everse, maxime apud Excestre & Sanctum Ivonem*] *Imagines Historiarum* Autore (17) *Radulfo de Diceto*. [Post diutinam malaciam, mare *Vergivium*, adeo per totam hyemem, regnante tunc *Henrico* secundo, tempestatibus agitabatur, ut toto illo temporis spatio, Navicula nulla ad *Hiberniam* adpulsa, de reliquo terrarum orbe nihil apud eam inauditum. Terror hinc universus, tamquam malo impendente quodam gravi, de cœlis missio. Arenarum aggeres, in *Australi Cambria*, quasi Cataclysmo abluebantur, Litora subvertebantur] *Giraldi Cambrensis* (18) *Hibernia* expugnata.

At ô quam terribilis illa tempesta, qua, Maris Undam in Oceanum *Britannicum* impellente *Africo*, ita ille turgebat, ut Pharos illa celeberrima, *Ed-distone* appellata, quæ fuit e regione *Plimuthæ*, tamquam in contemptum *Æoli* *Neptunique* fabricata, quasi ludibrio habita simul cum ædificatore dirueretur. Cujus utique tempestatis in hoc nostro Oceano si non eadem vis & potestas esse videatur, atque illarum in prædictis Oceani *Germanici* Exundationibus, propter majorem ab hisce stragem & damnum in *Hollandia Zeelandiaq;* factam; Litoribus hoc nostris rupibus munitis, quæ & duriores & altiores quam apud *Batavos* sunt, deberi judico.

Tempestates (ut argumentum hoc conficiam) quæ in Oceanis *Germanico* & *Britannico*, nostra & patrum memoria sæviere, & de quibus omnino constat, adeo fuere turbulentæ, ut si earum aliquæ in Chersonesum, ad hosce dies usque manentem, recta fuissent collineatæ, nullus (ut opinor) esset dubitandi locus, quin a tanta vi auferretur Isthmus: & tot annorum sæculis, quot illico dicentur, revera hoc accidisse nequaquam improbabile videtur. Sin ex *Americâ* turbo maris æstui superveniat, mare, cœlum, omnia miscens, omnia confundens, ac si naturæ instaret dissolutio, (posse vero hæc concurrere nemo sanæ mentis ibit inficias) En causam huic negotio parem!

Alterum hujus Dissertationis membrum jam aggrediamur, & speciatim inquiramus, utrum exesa fuerit revera hæc Chersonesus; annon. Si de ejus dividendæ modo, quâ fieri posset, conveniat, magna inde lux emanabit, unde argumenta, quæ a Viris doctis passim afferuntur, ad divisionis hujus probabilitatem arguendam, egregie confirmabuntur: præmissio nempe (quod hactenus fuit desideratum) Vento, ejusque in elidendo hoc Isthmo virtute omnium causarum maxima, tantoque negotio (cum cæteris) pari. Horum ego argumentorum nonnulla persequar; sed leviter tangam, utpote ab aliis fufius antehac tractata.

(16) *Lamentable News from Monmouthshire*. (17) Pag. 710. (18) Cap. XXXV.



Primo, Terræ jugum illud notabile, quod Fretō subicitur, & de quo supra; quid aliud sibi vult, quam quod eo loci Terra olim multo altior esset; at, Maris per aliquot annorum millia reciprocationibus, ad eum in quo nunc est statum abluta & detrita? Præcipue, si advertamus Regulam hanc constantem & perpetuæ veritatis esse, *Maris scil. imum, quo magis Oceano præterlabente tritum, (quantum patitur ejus durities) eo magis planum & æquale reddi.*

Quid deinde Rupes in Freti Litoribus oppositis, sive Montes prærupti, albi, ex eadem materia, Calcæ nimirum & silice compositi, ad sex utrobique milliaria, sibi invicem, tanquam Tesseræ respondentes; quid, inquam, volunt, nisi olim interfringi se, & ablutione Terræ interpositæ disrumpi?

Tertiū, apprime convenit cum isthac Chersonesi *Britannicæ* opinione, tractus illius, qui hodie *Rumney-Marsh* appellatur, ratio & ingenium. Durante enim Isthmo, cum Oceani fluxus eo tanquam obice sisteretur, æstuarium eum necesse erat, atque adeo Terram illam *Rumneiensem*, utpote planam & humilem, in propinquo exundare. Hoc ostendunt Oceani *Britannici* Fluxus hodieque hac planitie altiores, aggere fortissimo & magnis sumtibus aspulsi: Dentes item ostendunt, atque Ossa, sive Hippopotami sive alius cujusdam marini animalis (19), anno 1668, *Charthami*, altitudine pedum 17, dum puteus aperiretur, eruta: at luce clarius ostendit Anchora, non ita pridem ex alto loca hæc circiter effossa. Perrupto autem Isthmo obiceque jam remoto, Oceani unda subsidit, a Terra illa recessit, in alveum se contraxit; unde quæ olim Æstuarium, hodie Planities, longa viginti milliaria, lata octo, eaque fertilissima bobus saginandis aptissima reperitur.

Novissime, fac Chersonesum olim fuisse, Lupos, aliaque animalia, generi humano inimica, posse huc migrare, conceptu facillimum est: at si illa non fuit, navigiis ea, tamquam ad tuendas & conservandas eorum Species, advehi, stulte cogitabimus?

Neque me moratur, quod nulla sive *Latinorum*, sive *Græcorum*, sive alius cujusvis populi Historia Chersonesi hujus abruptæ mentionem fecisse perhibeatur, (quamvis hoc nequaquam ex omni parte verum:) Dic sodes, Historiæ quam brevis sit ætas, si ad ætatem mundi comparetur. A rerum initio ad primam, quæ nunc exstat (i. e. *Herodoti*) Historiam, 3500 circiter anni sunt; & a *Noæ* Diluvio, 1800. At tam immenso temporis spatio (quod supra innuimus) quæ Causarum accidere possint *αἰετὸς*; quæque ex iis in orbe nostro fieri mutationes, nemo tam cito statuere debet. Dixi hoc nequaquam ex omni parte verum: quid enim planius illo *Virgilii*, — *Penitus toto divisos orbe Britannos.* [Nonne putatis, (inquit eruditissimus & Antiquitatem *Britannicarum* scientissimus (20) *Joh. Twinus*) vocabulum [divisos] habere eam vim ut significat abscissionem alicujus ab aliquo? Et Auctorem mirægnarum significationis fuisse, & rerum antiquarum maxime peritum, & bene memorem sui? Ad hæc verba *Servius* [Quia olim juncta fuit Orbi Britannia.] Nihil clarius esse potest ad demonstrandum Isthmi hujus divisionem veteribus

(19) Vide Clariss. *Somneri* Diatribam *Chartham-News* appellatam: Et Clariss. *Wallisi* de hac Chersoneso Dissertationem, supra traditas. (20) *Derebus Albionis*, pag. 22.



fuisse notam. Ut omnino frustra esse *Vossius*, & nimio plus εὐθέσει δαλῶεν existimetur, cum in Fabellis *Ægyptiacis* (quo nempe suæ opinioni habeatur honos) cam poni voluerit.

Concludimus ergo e prædictis simul acceptis. *Britanniam non jam inde ab initio fuisse Insulam, sed ex Pene-Insula factam: idque ut videtur, a Vento e sævioribus aliquo, cum Maris æstu concurrente & Isthmum perrumpente.*

VIII. The *Vestigia* of a Roman Town, upon the Moor near Adel Mill, four Miles from *Leedes*, were found out accidentally by a Tenant of Mr. *Arthington*, who endeavouring to plow part of his Farm, was retarded by a great quantity of Stone, immediately below the surface of the Earth, which he was forced to dig up before he could proceed, and has already out of the Foundations of Houses, which they traced on both sides the Street, got so many Stones as has built above 100 rods of Walling. At a very little distance is a *Roman Camp* pretty entire, 'tis above four Chains broad and five long, surrounded with a single Vallum, which from the top of the Agger to the bottom of the Trench is yet 22 foot deep in the place I measured. The Town seems to have been of considerable note by the *Inscriptions*, and fragments of *Statues*, *Pillars*, &c. there dug up, all which are (as Dr. \* *Lister* has truly observed, of most of the *Roman Monuments* in these parts) made of the common sort of coarse Rag or Millstone grit, of which are also the remains of a large *Aquæduct*, in Stones of great length and about  $\frac{3}{4}$  of a yard thick, wherein the passage for the Water is about 6 inches broad and as many deep, almost double to those of Clay found in the *Roman Burying-place* at *York*, formerly † accounted for. Some time ago here was dug up a *Statue* to the full proportion of a *Roman Officer*, with an *Inscription*, both which perished through the brutish ignorance and covetousness of the Labourers. *Cyril Arthington*, Esq; who is Lord of the Mannor, made me a present of two *Inscriptions*, the one is but a fragment, yet has enough to discover it to have been sepulchral, by H S E for *Hic situs est*, below *PIENTISS*, the other is almost entire, and is evidently a *Funeral Monument*, it begins as usually with *Diis Manibus Sacrum*, and ends *Vixit Annos X.* as it seems to have been by the vacancy; 'tis one foot thick, two broad and three high, the Letters are very large, full three inches long, some of them interwoven, as AND (AD) and ED (as I apprehend the EC to be) in *Candiedianæ*. The form of the Letters, and particularly the A may perhaps discover the Age that this *Roman Station* flourished in, viz. in *Severus's* Reign (*An. Dom.* 194) or before, if Mr. *Cambden's* \*\* observation hold good, and I know none of the modern Criticks that dissent from it. " This observation (says he) I have made, that from the Age of *Severus* to that of *Gordian* and after, the Letter A in the *Inscriptions* found in this Island, wants the cross stroke, and is engraved thus Λ. It seems to have perished, and perhaps was burnt down (as by the flag and adust colour in some places may be conjectured) in some of the *Insurrections* of the *Native Brigantes*, who were impatient of Restraint.

*The Vestigia of a Roman Town near Leeds, by Mr. Thoresby. n. 282. p. 1285.*

\* *Phil. Collections No. 4. p. 90. 91. Abr. Vol. iii. p. 416.*

† *Phil. Transf. n. 234. Abr. Vol. iii. p. 421.*

\*\* *Britannia. N. E. p. 808.*



Among the ruins were found two or three *Millstones* for the grinding of Corn, which by the smallness of the size (20 inches broad) shew that the *Romans* of those, as well as the *Ægyptians* and *Jews* of former Ages, made use of their Slaves or Captives for that employ, who were placed *post molas*,

\* Exod. xi. 5. \* *non præcedunt sed sequuntur, brachiis & toto corpore trudentes*; what the old

† Judg. xvi. 21. MSS Bibles have in respect of *Sampson* † *clausum in carcere molere fecerunt*,

†† Mr. our *Saxon* Predecessors render expressly †† *hanbcpypne*. Besides this, which

†† *Mr.* is entire, I have a fragment of another *Millstone*, whereon the Rows are  
†† *hwaits's* yet remaining, but this being heavier, almost as thick at the Circumference  
†† *Hept. Anglo-* as the other is at the Center (for they are convex on one side) I suppose  
†† *Sax.* might be the *Runner*. The Learned \* *Gataker* observes, the Original word

\* *Notes on* is of the *Dual form*, and that the Law prohibiting the taking the *Millstone*

†† *Isaiah* 47. 2. to pledge, does particularly mention *Receb* or the *Rider*, because that lying

loose might the more readily be taken off, and carried away upon that oc-

†† *Note on* casion, and † says, the *Talmudists* have a Story, that the *Chaldeans* made the

†† *Lam. v. 13.* young Men carry *Millstones* with them to *Babylon*, where there was a great

scarcity of them, whence probably their Paraphrase renders that Text,

*have born the Mills or Millstones*, which might be true in a literal acceptation,

they have also a Proverbial Speech of a Man with a *Millstone* about his

Neck (alluded to *St. Matth. xix. 6.*) used of one that lyes under an exceeding

heavy and almost insupportable burthen.

As we were traversing the Ground, I found the fragments of *Urns* and

other *Roman Vessels*, one of which has been 23 inches, or two foot in Cir-

cumference, the generality of them are of the common red Clay, but I have

also one of the best Coral coloured varnish, and others of a bluish grey; as

also a brass Ring found in the same place. The *Roman* rig that this Town

stood upon, comes from the great Military Road upon *Bramhammoor*, of

which *Leland* in his MS Itinerary, which by the favour of my Lord Arch-

bishop of *York* I have a transcript of as far as it relates to *Yorkshire* or *Lan-*

*cashire*, affirms, " I never saw in any part of *England* so manifest a token as

" here, of the large Crest of the way of *Watling street* made by hands. From

thence this *via vicinalis* passeth by *Thorner* and *Shadwel*, *Streetlane* and

*Hawcaster ridge* upon *Blackmoor* (near which is a *Roman Pottery*) to *Adel*,

thence thro *Cookridge* over the Moors towards *Ilkley* a known *Roman Station*.

This same ridge is very evident in some part of the Grounds †† of *Tho. Kirk*

†† *See Phil.* of *Cookridge*, Esq; who shewed me the place where a *Roman Monument* in

†† *Transf. n. 316.* his possession was dug up, it seems to have had a large Inscription, but so

†† *p. 134. and* erased that nothing distinct can be made of it; perhaps the said *Cukeryg*, as

†† *Roman Coins* it is called in the Original Letters Patents of *K. Edw. 6th* to Archbishop

†† *infra.* *Cranmer* was so denominated from this *Roman ridge* which passeth directly

thro' it.

But what the name of this Station was I cannot divine, the learned *Dr.*

*Gale* some years ago gave me notice from an Anonymous Geographer, of

a Station in *these parts* called *Pampocatia*, which he thought should be read

*Campocatia*, and had sent into *France* for various Lections, concluding,

" Where to place this I know not, but my hopes are, that you will be so

" happy



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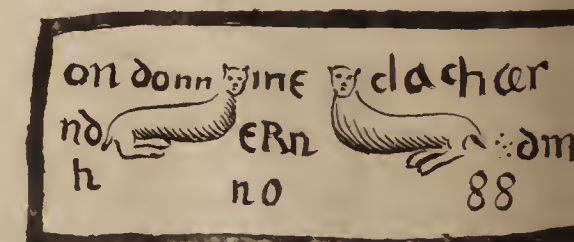
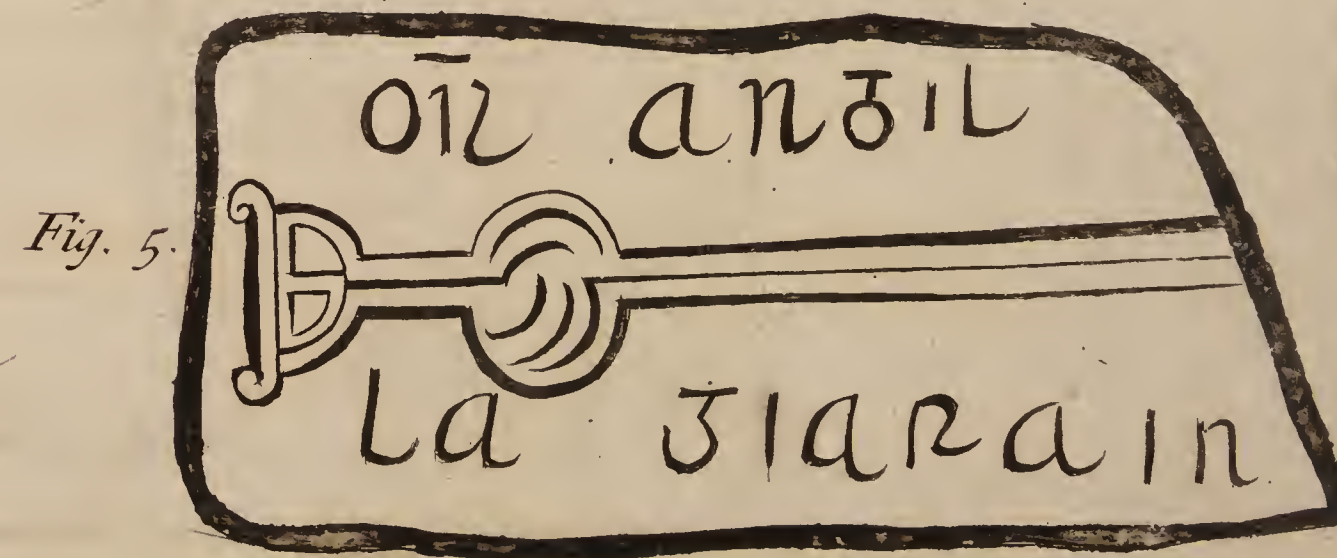
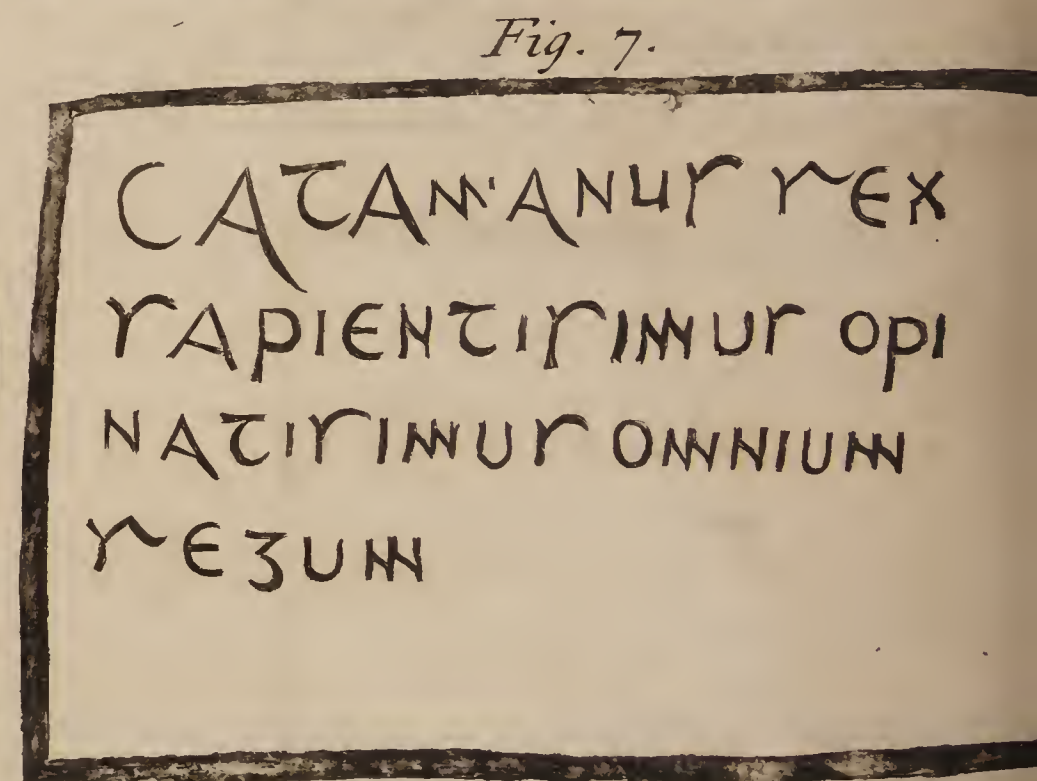
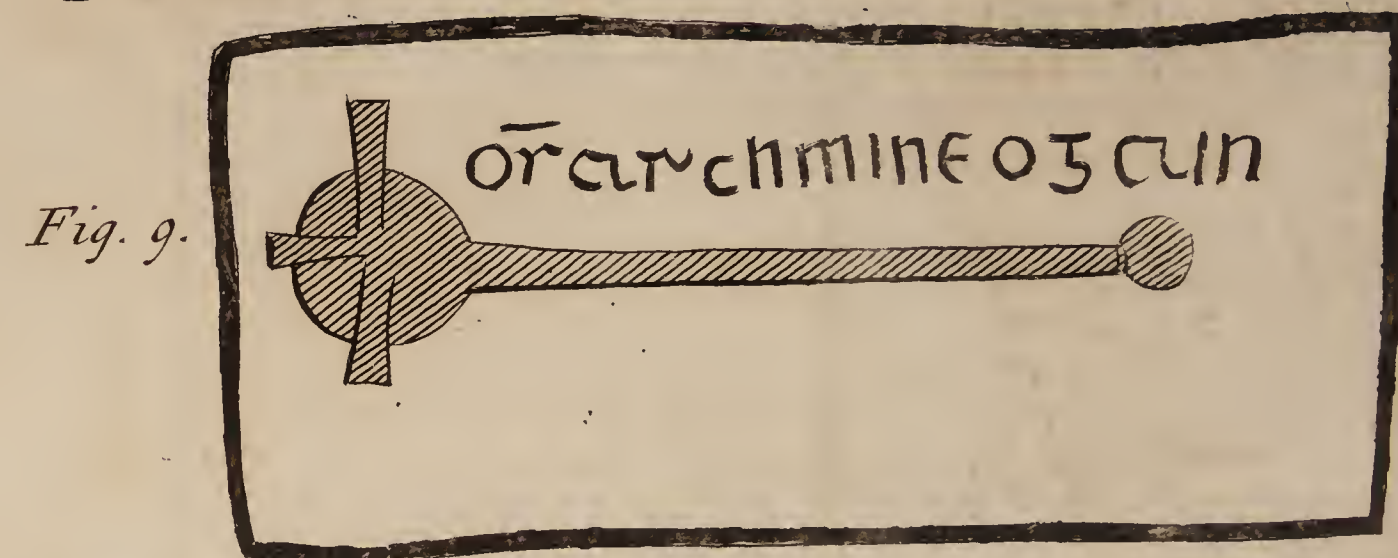
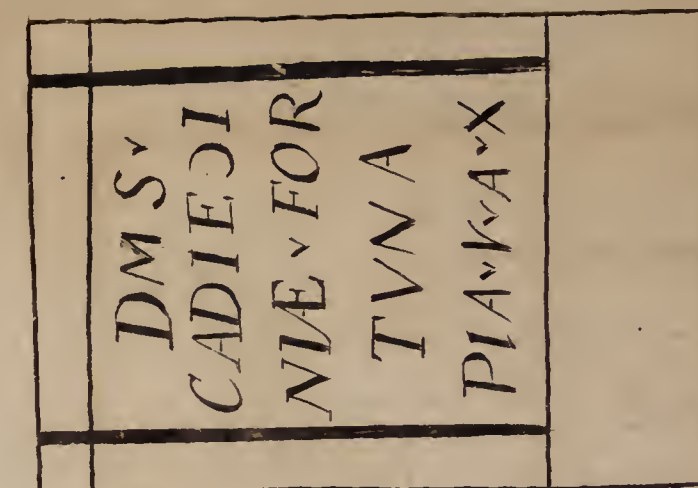
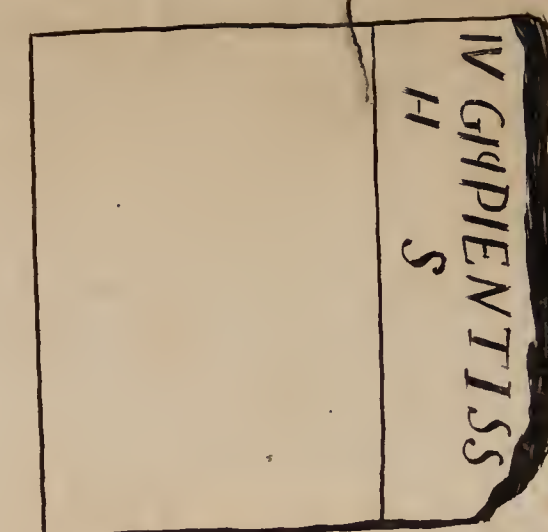
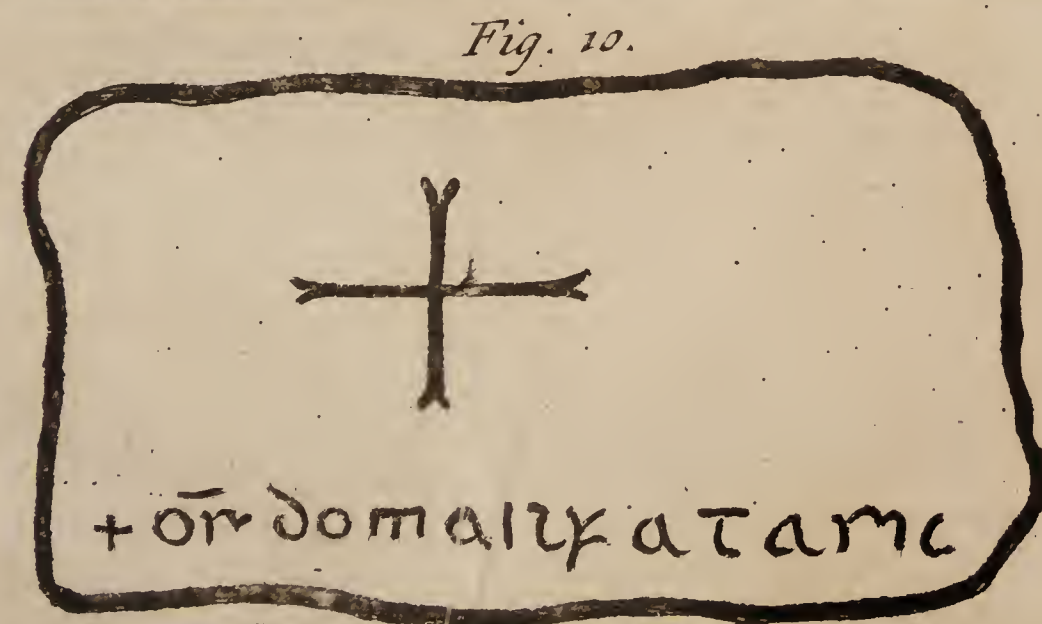
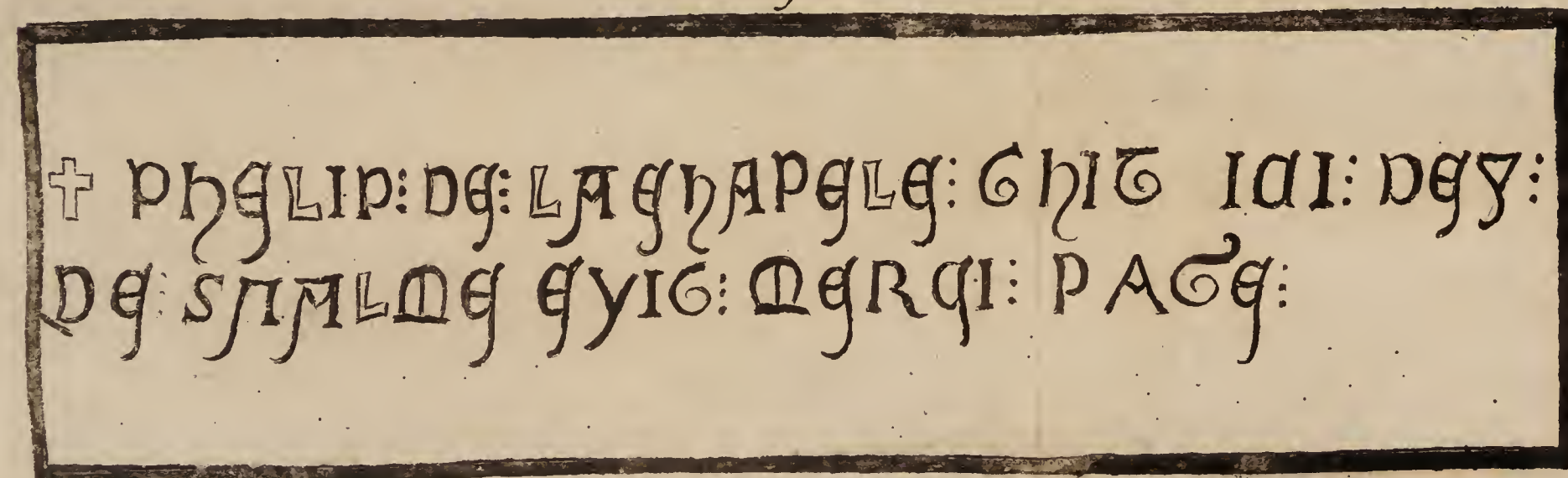
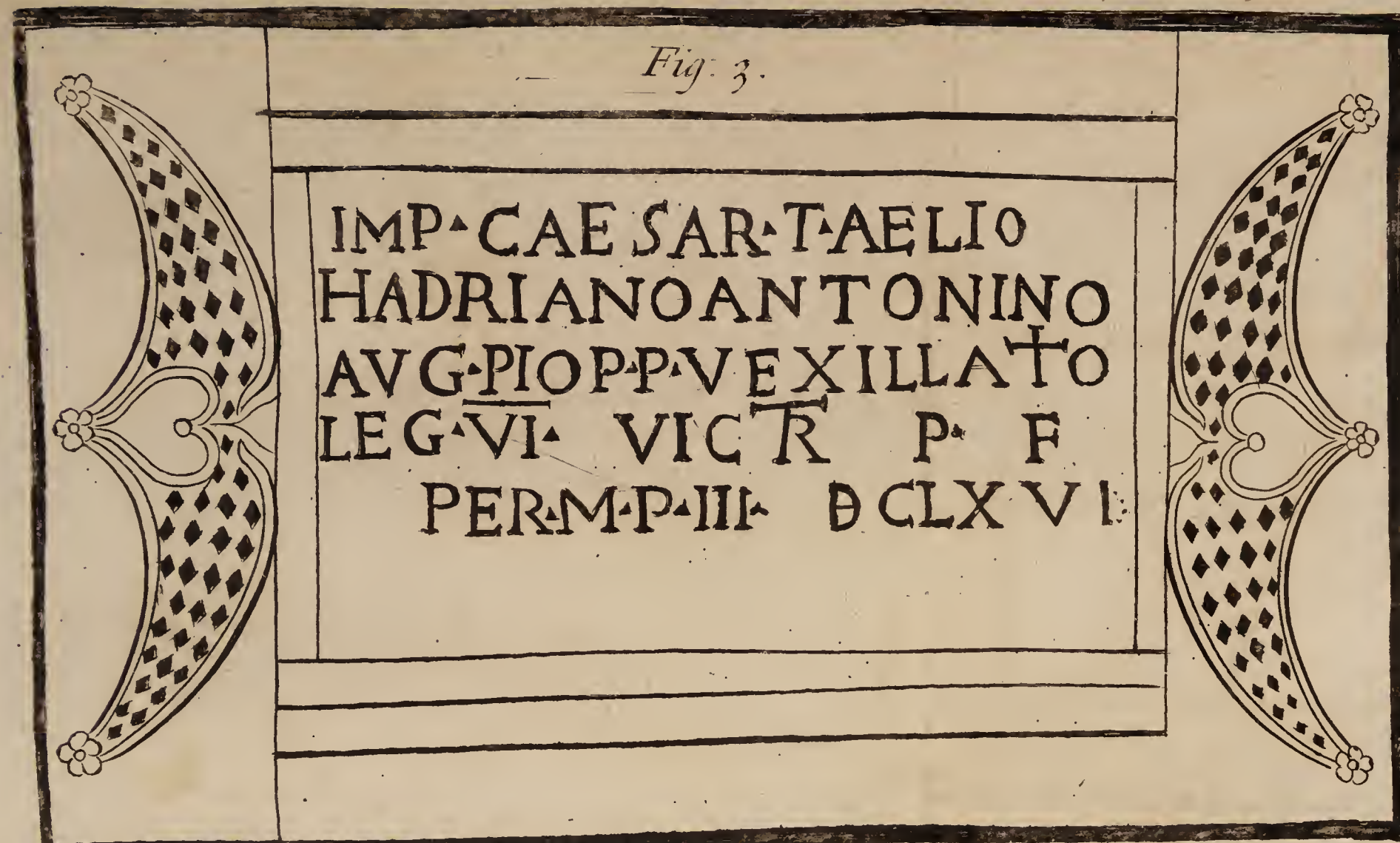
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“happy as to find it, and so kind as to communicate the discovery, &c. See Plate 4. Fig. 1. Now considering, that in the said Author (Printed at *Ravenna, An. Dom.* 1688.) this *Pampo* or *Campocatia* is the very next Station to *Lagentium* or *Legeolium*, it seems not improbable that this Camp, &c. was the very place; but because things so many Ages past admit of various conjectures, I will offer another, which I am induced to from the similitude of the Names, the *Agel* or *Adelocum* of the Ancients, and the present *Adle* or *Adel* as it is in the *Monasticon Anglic.* 'Tis true, 'tis sometimes writ *Segelocim*, but as Mr. Burton \* well observes, it is to be reckoned among those Words to which the Ancients sometimes put an S or *Sibilus*, and sometimes omitted; if this be thought too much Northward for that Station, which is placed South of *Danum*, it may be reply'd, that, not to insist upon the transposition of some places, of which there are instances in the Itinerary, I see no inconvenience in admitting that the *Romans* might then, as we at this day, have several Towns of the same denomination; thus from an Altar in my possession, inscribed *CONDATE* (the whole Inscription may be seen in the new Edit. of the *Brit.* p. 782.) the said Learned Dean of *York* concludes that *Consley* near *Piersbridge*, where this Altar was found, was as well called *Condate*, as *Congleton* in *Cheshire*. And to me it seems highly probable, that the Legions being detached against the Enemy to distant places, might endeavour to leave such Memorials of their removes: Thus the *Legio vicesima valens victrix* usually quartered at *Deva* or *West Chester*, was detached into *Westmorland*, as appears by an Inscription; and the *Lingones* who were seated at *Ilkley*, I question not but were also at *Lingivel* near *Thorp on the Hill*, where the Roman Coyning molds † were found, and that the intrenchments there were so denominated from them, the *Roman Vallum* being pronounced *Wallum*, of which see *Casaubon*, *Somner*, &c. At this *Agelocum* or *Adelocum*, as *Cambden* himself once read it, in a Church of the most Antique form that ever I beheld, and being built of small squared Stones like the *Roman Wall* and *Multangular Tower* in *York*, I verily thought it the remains of some *Roman Temple*, till I found in it some Christian Histories, particularly the descent of the Holy Ghost in the form of a Dove, done in *Basso Relievo*, but after so intolerably rude a manner, as sufficiently evidences their great Antiquity. The Inhabitants have an old Tradition, that *Adel Church* once stood upon *Blackhill*, the place where these *Roman Monuments* were lately discovered, occasioned perhaps by the removal of the Stones from some publick Edifice, at the destruction of the old *Roman Town*.

\* Com. on *Antonin. Itin.*

† Phil. Tr. No. 234. Abr. Vol. iii. p. 426.

When the *Vestigia* of this *Roman Station* were first discovered, I was ready to fancy it to have been the *Adellocum* of the Ancients, from some remains of the Name in the present *Adle* or *Adel*, as it is writ both in the *Monastic. Anglic.* and some ancient Charts in my possession; but when I was last at *London*, having by the favour of *Peter Le Neve*, Esq; *Norroy King at Arms*, an opportunity of perusing *Domesday Book* in the *Exchequer*, I found besides *Adele* and *Echope* beforementioned, another Place in the Neighbourhood, call'd *Burghedurum* or *Burgdunum*, which I am now ready to conclude, was the Ancient *Roman Name* of this Station: That the Itine-

n. 320. p. 314.



rary is silent herein, is no Argument against it, since only such as lie upon those Roads are particularly mention'd; but that it has, at least, the Appearance of a *Roman* Name may be argued, because *Burgi* was the common Name whereby they called such Castles or Forts as were convenient for War, and well stored with Provisions of Corn, as appears by the Authorities quoted by *Camden* and *Burton* in their Notes upon the *Roman Verteræ*; or *Burgh* under *Stanemoor*; and the *Burgundians* receiv'd their Name from their inhabiting such Castles: and to me it seems probable, that the small squared Stones, wherewith the very Antique Church at *Adel* is built, were brought from the Ruins of such a Castle, and gave rise thereby to an old Tradition, which continues to this day, that *Adel-Church* once stood upon *Black-hill*, the place where these *Roman* Monuments were found; the elevated situation of which place sufficiently accounts for the termination of the Name, the *Gaulish* or *British Dunum*, which signifies a Hilly or Mountainous Place, being naturalized in the *Roman* Provincial Language. I shall only add, that within a Mile of it, there are two scattering Houses, that do to this Day retain the Name of *Burden*- (for *Burgdun*-) Head.

Of the ancient  
Carteia, by  
John Con-  
duitt, Esq; n.  
359. p. 903.

\* Antiguada-  
de las Ciuda-  
des de Espan-  
na. c. 1.

IX. About four *English* Miles *N. W.* from *Gibraltar*, at the end of the Bay, there are considerable Ruins. The place is called at present *Rocadillo*, and consists of a few Huts, and a Modern Square Tower, which appears to have been raised on the Foundation of a much greater Pile. The Walls of the old City are very easy to be traced. They seem to have been about two *English* Miles in Circumference, and were built upon the Brow of a rising Ground. The space within is covered with Ruins, among which are a great many pieces of very fine Marble well wrought; and innumerable fragments of Vessels of that kind of red Earthen Ware, which \* *Ambrosio Morales* lays down for a certain mark of a *Roman* City, and takes to have been a Composition of the Clay of *Saguntum*, often mentioned among the *Romans*.

*Ficta Saguntino pocula malo luto.* Mar. Lib. VIII. Ep. 6.

*Sume Saguntino pocula ficta luto.* Lib. XIV. Ep. 108.

There are remains of a rude Semicircular Building, raised on Arches, which descends gradually into an Area, and seems to have been a kind of Theatre. I brought away with me a Marble Pedestal of a Statue, dug up near to the Square Tower. The Marks where the Feet and the extremities of the Drapery were fastened to it, are still to be seen, and the following Letters finely cut *VARIA MARCE*. It was given me by the owner of the Ground, who said he had read upon it formerly three other Letters *LLA* since broken off. There are other Inscriptions, but so defaced and ill Cut, that they do not deserve a particular mention. I have a considerable number of Medals, that were found among these Ruins; most of them have a *Caput turritum* with *CARTEIA* in very legible Characters. The Re-  
verse











verse is generally a *Fish*, a *Neptune*, or a *Rudder*. Towards the *West* there is an easy Descent to the River *Guadarranque*, which takes its Source at *Castellar*, about four Leagues in the Country, and is very deep at *Rocadillo*. There is a Bar where the River falls into the Bay; but it does not hinder the entrance of Vessels of 15 Tun, to load Charcoal and other necessaries, that are shipt off from thence for *Ceuta*. Along the side of the River there is still a great deal of Stone Work and visible remains of an Ancient Key. At a small distance to the East, upon an Eminence, there are considerable ruins of a Square Castle, which appears to have been an ancient Building of very great Strength. The Country People now call it *Castillon*, but the *Corrigidor* of that District told me he remember'd it called *Torre Cartagena*. The Situation agrees exactly with the Tower of that Name, mentioned in the 274<sup>th</sup> and 316<sup>th</sup> Chapters of the Chronicle of *Alphonso XI* of *Castile*. A Book of great Authority among the *Spaniards*, who are generally of Opinion that it was formed upon the Memoirs of *Fernando Nunnez de Valladolid*, a Favourite and Minister of that King, tho' it goes under the name of another Person.

All the *Spaniards* who live about the Ruins I have been describing, say they are the remains of a City of the *Gentiles* called *Cartago*. The corruption of *Carteia* into a name so much more talked of, might easily happen in an Oral Tradition of so many Years; and I cannot help thinking that, where other Circumstances concur, an account deliver'd down from Father to Son is an evidence not to be slighted, in matters of so much obscurity.

Frequent mention is made of *Carteia* by the Ancient Geographers and Historians. I build so much on two Passages of *Livy*, that I am obliged to insert them at length. (*Livy* does not mention from what Port *Lælius* sailed for *Carteia*, but by what goes before, it seems to have been from *Cartagena*, at that time *Scipio's* Head Quarters) \* *Lælius interim, freto in Oceanum eve-* \* Lib. xxviii.  
*ctus, ad Carteiam classe accessit.* (*Urbs ea in orâ Oceani sita est, ubi primum* c. 30.  
*è faucibus angustis panditur mare*) *Gades sine certamine proditiōe recipiendi*  
*(ultrò, qui eam rem pollicerentur, in castra Romana pervenientibus) spes, sicut*  
*antea dictum est, fuerat. Sed patefacta immatura proditiō est, comprehensosque*  
*omnes Mago Adherbali Prætori Carthaginem devehendos tradit. Adherbal,*  
*Conjuratis in quinqueremem impositis, præmissaque eâ, quia tardior quam tri-*  
*remis erat, ipse cum octo triremibus modico intervallo sequitur. Jam fretum*  
*intrabat quinqueremis, cum Lælius & ipse in quinqueremi, è portu Carteiæ,*  
*sequentibus septem triremibus, evectus, in Adherbalem ac triremes invehitur;*  
*quinqueremem satis credens deprehensam rapido in freto, in adversum æstum re-*  
*ciprocari non posse. Pœnus, in re subitâ parumper incertus, trepidavit utrum*  
*quinqueremem sequeretur, an in hostes rostra converteret. Ipsa cunctatio facul-*  
*tatem detrectandæ pugnæ ademit: jam enim sub icu teli erant, & undique*  
*instabant hostes. Æstus quoque arbitrium moderandi naves ademerat; neque*  
*erat navali pugnæ similis, quippe ubi nihil voluntarium, nihil artis aut consilii*  
*esset. Una natura freti æstusque totius certaminis potens, suis, alienis navibus,*  
*nequicquam remigio in contrarium tendentes invehēbat; ut fugientem videres re-*  
*tro vortice intortam victricibus illatam, & sequentem, si in contrarium tractum*  
*incidisset*



*incidisset maris, fugientis modo sese avertentem. Jam in ipsâ pugna hæc, cum infesto rostro peteret hostium navem, obliqua ipsa ictum alterius rostri accipiebat: Illa cum transversa objiceretur hosti, repente intorta in proram circumagebatur.*

\* Lib. XLIII. The other \* is, *Et alia novi generis hominum legatio ex Hispaniâ venit: Ex militibus Romanis & ex Hispanis mulieribus, cum quibus connubium non esset, natos se memorantes, supra quatuor millia hominum, orabant ut sibi oppidum in quo habitarent daretur. Senatus decrevit, uti nomina sua apud L. Canuleium profiterentur, eorumque siquos manumisisset, eos Carteiam ad Oceanum deduci placere. Qui Carteiensium domi manere vellent, potestatem fore uti numero colonorum essent, agro assignato, Latinam eam coloniam fuisse, Libertinorumque appellari.*

The best Spanish Authors, and Ortelius and Cellarius trusting to them, take this Carteia of Livy to be different from that which was the next to Calpe, and place it generally about Conil. Rodrigo Caro in his *Convento Juridico de Sevilla* C. 24. applies the Carteia in the XLIII Book of Livy to Rocabillo, and in Cap. 74. to Cartaia near Lepe. It is surprizing he takes no notice of the Passage in the XXVIII Book. For the particular mention of *ad Oceanum*, and *Urbs ea in ora Oceani sita est*, implies they both relate to the same place; perhaps it was because he could not reconcile it with his

† Lib. II. c. i. Cartaia near Lepe. † Cellarius makes Bæsippo this Carteia of Livy. *Bæsippo, quæ videtur Carteia Livii esse, extra fretum & columnas posita. Aliam pro Livio Carteiam non invenio; tho' in all the ancient Geographers, Bæsippo is mentioned by it self as a distant Town. I am so far from seeing any necessity of erecting a new Carteia in the Ocean for these Passages in Livy, that I take that in Lib. XXVIII. to be rather a proof that the City there mentioned, stood at Rocabillo. It certainly agrees much better with that Situation, than with Conil or Carteia near Lepe. It is not to be reconciled with the latter, because that lies North West of Cadiz, from whence Adherbal set out for Carthage, and is a good way up the Country, on the side of a River, and not in ora Oceani. Neither can Conil be said properly to be situated Ubi primum è faucibus angustis panditur mare; for the Sea widens considerably before it reaches the Capes Spartel and Trafalgar, and becomes an Ocean where that Town stands. It is observable that Mela applies words of the same import with those of Livy to the Sea between Calpe and Abila. Barbeful; Aperit deinde angustissimum pelagus. There is no Harbour at Conil, or any other place between Cape Trafalgar and Cadiz. If the Carthaginian Quinqueremis had only been going into (intrabat) the Mouth of the Streights between Cape Spartel and Trafalgar, Lælius could not have believed it satis deprehensum rapido in freto, in adversum æstum reciprocari non posse, for there is no such strong Current there; and the action between him and Adherbal's Triremis, which were at some distance behind the Quinqueremis, must have hapned Westward of those Capes; which is inconsistent with the description Livy gives of it; because in that part of the Ocean there are none of those Eddies, that appear to have had so particular an effect on both the Fleets, during the Engagement, and are peculiar to the Middle of the Gut. This general mistake seems to have been occasioned by giving too easily into the*



the opinion, that *Livy* understood by the *Fretum* all the Sea between the Capes *Spartel* and *Trafalgar*, and the Rock of *Gibraltar* and *Apes-Hill*; when it is more probable that he termed strictly so only the narrowest Part, which was generally reckoned to be between the two latter: *Mela. Proxima Africa & Europæ littora montes efficiunt Calpe & Abila.* *Pliny* takes *Mellaria* to be nearest to *Africk*, and therefore places there the *Fretum ex Atlantico mari Lib. 3.* which is an argument his *Fretum* was not the same with our Streights, and that he carried the Atlantick Ocean much farther East than the Capes *Spartel* and *Trafalgar*.

Other Authors seem to make the Pillars of *Hercules* the Boundary of the Mediterranean and the Ocean. *Marcianus Heracleotes.* Ἐνταῦθα πέρας ἔχει ἡ Βασιλικὴ Ἰσπανίας τὸ μέρϑ τὸ παρῆκον παρ' ἐκατέρως τὰς θαλάσας τὰς πρὸ τ' Ἡερκλείων πορθρὸν τυγχανούσας, τὴν τε καθ' ἡμᾶς ἢ τ' ἔξω, τῶν ἐστὶ τ' Ὠκεανόν. *Hic finem habet Hispaniæ Beticæ pars contingens utraque maria quæ circa fretum Herculeum, tam mare nostrum quam mare exterius, h. e. Oceanum.* Τῆς μὲν Βασιλικῆς τὸ πλεῖστον πρὸ τ' καθ' ἡμᾶς κεῖται θαλάσσης, τ' Ἡερκλείων ἐντὸς σηλῶν, μέρος δέ τι πρὸ τ' δυτικόν Ὠκεανόν. *Beticæ quidem pars maxima prætenditur nostro mari, Herculeas intra columnas, pars vero quædam occidentali Oceano.* *Polybius*\* Κα- \* Lib. III. λείται ἡ τὸ μὲν πρὸ τ' καθ' ἡμᾶς παρῆκον ἕως Ἡερκλείων σηλῶν, Ἰβηρία τὸ ἢ πρὸ τὴν ἔξω ἢ μεγαλύτερον προσαγορεύομεν κοινὴν μὲν ὀνομασίαν ἔχει, ἀλλὰ τὸ προσφάτως κατοπιόεσθαι. *Quæ porrigitur secundum mare nostrum portio ad columnas usque Herculis Iberia nominatur; quæ secundum mare externum, quod & magnum appellatur, communem appellationem nondum invenit, quia non diu est cum fuit explorata.* *Appian*† Ἐμφυλ. πρὸ τ' τε τὰς σηλᾶς τὰς Ἡερκλείας τ' Ὠκεανόν ἐπέργων. † Lib. II. *Trajecto ad Columnas Herculis Oceano.*

*Florus.* †† *In ipso ostio Oceani Varius Didiusque legati conflixerunt; sed acrius fuit* †† Lib. IV. *cum ipso mari, quam inter se navibus bellum: Siquidem velut furorem civium c. 2. castigaret Oceanus, utramque classem naufragio cecidit. Quinam ille horror, cum eodem tempore fluctus, procellæ, viri, naves, armamenta confligerent! Adde sitis ipsius formidinem, vergentia in unum hinc Hispaniæ, inde Mauritaniciæ littora; Mare & intestinum & externum, imminentesque Herculis speculas; cum omnia undique simul prælio & tempestate sævirent.* Here the Pillars of *Hercules* are made the very Mouth of the Ocean. If you understand the *Fretum* of *Livy* in this Sense, and reckon it to signify only the Sea between *Calpe* and *Abila*, and the Ocean to begin from thence *Westward*, the Passage in the XXVIII<sup>th</sup> Book is an accurate description of *Rocadillo.* *Lælius interim freto in Oceanum evectus ad Carteiam classe accessit. Urbs eâ in ora Oceani sita est, ubi primum è faucibus angustis panditur mare.* And allowing *Lælius* to set out against *Adherbal* from thence, every circumstance mentioned by *Livy* is so easy to be accounted for, that it is needless to make Application. A Passage in *Dio Cassius* \* induces me to believe the Vessels anchored in the \* Lib. XLIII. *Gûadarranque*, and that that River, and not the Bay, was properly *Portus Carteia.* Οὐαρεϑ ἡ ὑπὸ τ' Διδίῳ πρὸ Κεραλίας ἐναυκραλήθη, ἢ εἴγε μὴ προκαλαφύγων ἐς τ' γῆν, ἀγκύρας ἐς τὸ σόμα τ' λιμνὴν ἀλλὰς πρὸς ἀλλὰς προσεγεβεβλήκει ἢ πρὸ αὐτὰς οἱ πρῶτοι τ' διωκόντων σφᾶς, ὥστε πρὸ ἔργου ἐπτοήκεισαν, πᾶν ἂν τὸ ναυτικόν ὑπολάλῃ. *Varus vero à Didio apud Crantiam navali prælio superatus in terram evasit,*



*evafit, conjeñtisq̃ue in introitum portûs anchoris, ita ut una ab aliâ teneretur, cum ad eas, tanquam ad feptum quoddam, primæ inſequentium naves offendifſent, periculum totius claffis amittendæ declinavit.* This cannot be underſtood of the Bay, becauſe that is three Leagues over at the narroweſt part, and much too deep for a work of ſuch a Nature, which might eaſily have been effected upon the Bar of the River *Guadarranque*. There is no room to doubt of the emendation *Luis Nunnes*, in his *Hispanica*, has made here of Καρτήια for Κεαντία; for no ancient Author mentions any other Town or Harbour thereabouts of a name like that; and *Carteia* was the place which held out the longeſt for the younger *Pompey*, and where he kept his Fleets.

*Florus* in the Paſſage I have already quoted, relating the ſame Action between *Didius* and *Varus*, repreſents in very lively Colours, the very Scene near *Rocadillo*. *Adde ſitus ipſius formidinem, vergentia in unum hinc Hispaniæ, inde Mauritanie littora; mare inteſtinum & externum, imminentesque Herculis ſpeculas, &c.* *Hirtius* \* ſays, *Cn. Pompeius ad navale præſidium parte alterâ contendit Carteiam, quod Oppidum abeſt à Corduba millia paſſuum CLXX.* which diſtance, as well as the Circumſtance of *navale præſidium*, agrees with the Situation of *Rocadillo*. The ancient Geographers place *Carteia* next to *Calpe* Weſtward. *Pomponius Mela*, after having given us a perfect Picture of *Calpe*, and deſcribed thoſe laſting Marks in which ſo many Centuries have made no alteration, ſays---- *Sinus ultra eſt, in eoque Carteia.* *Strabo* † *Ἐνταῦθα δὴ ὁρᾷ ἐστὶ τῆς Ἰβήρων ἢ Καλπῆς, &c. ἢ πρὸς αὐτὸ Καλπὴ πόλις ἐν τετραεξέκοντι ſαδίοις, ἀξιόλογος ἢ παλαιὰ, ναυαθμός ποτὲ γενομένη τῆς Ἰβήρων. Ἐνιοὶ δὲ ἢ Ἡρακλέους κτίσμα λέγουσιν αὐτῇ, ὣν ἐστὶ ἢ Τιμοσθένης, ὃς φησὶ ἢ Ἡρακλείαν ὀνομάζεσθαι τὸ παλαιόν, δείκνυθαι τε μέγαν οὐρίστον ἢ νεωσοίχους.* *Ibi mons Hispanorum eſt Calpe, &c. & ad XL inde Stadia Urbs Calpe vetuſta & memorabilis, olim Statio navibus Hispanorum. Hanc ab Hercule quidam conditam aiunt, inter quos eſt Timotheus, qui eam antiquitus Heracleam fuiſſe appellatam refert, oſtendique adhuc magnum murorum circuitum & Navalia.* *Casaubon*, in his Notes on this Paſſage is of Opinion it ſhould be Καρτήια πόλις. *Legendum cenſeo Καρτήια πόλις, nam eam urbem hic intelligi res ipſa docet; & ex eo colligi poteſt, quod toties eam infra nominans, nihil tamen de ejus ſitu alibi dixiſſe reperitur. At Calpen Urbem nemini Veterum ne nominatam quidem reperio. Marcianus Heracleotes makes Carteia 50 Stadia from Calpe: Either of theſe Diſtances agrees with Rocadillo, according to the part of the Rock from which they reckon; for it is above fix Miles from Europa Point to Rocadillo.*

‡ *Geog. Sacr. Lib. I. c. 34.* *Bochart* ‡ ſtrengthens *Casaubon*'s Opinion. *Nec fruſtrâ Heraclea Carteiæ fuiſſe vetus nomen, tanquam ab Hercule conditore. Herculem enim ſuum Phœnices Μέλκαρθον appellabant. Philo Biblius ex Sanchoniathone apud Eusebium L. I. Præparat. τῷδε Δημαρῶντι γίνεσθαι Μέλκαρθον ὃ ἢ Ἡρακλῆς. Ex Demarunte autem natus eſt Melcarthus qui & Hercules. Μέλκαρθος autem eſτὶ τῷ μελεχ Melech Kartha, Rex Urbis, i. e. Tyri. Idem Græcis Melicertes ſive Palæmon, Maris Deus, quem Cadmi nepotem eſſe fingunt. Hinc Heſychius ruruſus Μάλικα τῆς Ἡρακλείας Ἀμαθρόιοι. Omnino igitur ex Melcartho, vel μελεχ Melech Kartha. Urbs quam ad Calpen condidit Hercules Phœnicicus, primo Melcartheia*



*theia vocata est, Melech Karthia, quasi Ἡερκλείαν dixeris; deinde per Aphæresin Cartheia vel Carteia. Apud Hebræos frequens est hæc Aphæresis in nominibus locorum compositis. Tale Sittim pro Abel Sittim, Salem pro Jerusalem, &c.*

I have some Medals that were dug up at *Rocadillo*, with the Head and Club of *Hercules* upon them: which seem in some measure to support that great Man's Assertion. Upon the Reverse are Tunny Fishes, which according to *Strabo* and *Pliny* abounded formerly near *Carteia*, and are taken in great quantities near the Shoar of the East Sea, at a small distance from *Rocadillo*.

*Bernardo Aldrete*,\* an Author of such Weight, that *Bochart* does not disdain to copy him on several occasions, accounts for the Addition of *eia* to *Cartha*; which, in the *Syriack* and *Chaldæan*, signifies *Pulcher, Formosus*, and was affixed to the Name of this City to distinguish it from the *Cartha* in *Syria* mentioned, *Joshua xxi. ver. 34.*

\* Antigneda-  
des de Espan-  
na. Lib. II. c. 2.

By all accounts, the *Phœnicians* founded most of the Cities on this Coast, and probably *Carteia* was one of the earliest Settlements; for it lies very near *Africk*, in a most inviting Situation, having on one side a Bay, and on the other a River, which waters a rich Country. Its height gave it strength and a very beautiful Prospect; circumstances which seem to justify *Aldrete's* Interpretation of the latter part of its name.

In the Itinerary of *Antoninus*, it is *Calpe-Carteiam*, not *tanquam duæ urbes diversæ*, as *Casaubon* intimates in his Notes on the third Book of *Strabo*, for then it would be *Calpen Carteiam*; nor, according to *Surita's* Comment on that part of the Itinerary, *ut significet non rectâ iter ex Suel Carteiam deduci, sed paululum ad Calpen deflecti*; because *Calpe* stands at the end of a narrow neck of Land, which projects to the Southward a great way from the rest of the Continent; and consequently is quite out of the Road from *Suel* to any other place Westward of it; probably *Calpe-Carteia* is for *Carteia ad Calpen*, to distinguish it from the other *Carteia* in *Celtiberia* in † *Livy*: For as *Caro* observes, there is no necessity for the alteration *Sigonius* has made in that Passage of *Althæa* for *Carteia*, from the Text of *Polybius*; because *Livy* never mentions the other *Carteia* without adding *ad Oceanum*, *Urbs ea in ora Oceani sita est*; which distinction were needless, had there been only one City of that Name. *Strabo* ‡ mentions a City called *Καρχαλίας*, and places it near *Saguntum*, which is agreeable to the Situation given this *Carteia* by *Livy*.

† Lib. XXI.  
c. 5.

‡ Lib. III.

I am very much surprized that *Mariana*, and several others, should take the present *Gibraltar* to have been the ancient *Heraclea*; when neither *Pliny*, who resided so long in those Parts, *Mela*, who was born there, nor any ancient Geographer or Historian that I have met with, makes the least mention of such a City thereabouts, except *Strabo*; and he places it 40 Stadia from *Calpe*, at the Foot of which *Gibraltar* is situated. The *Spanish* Historians give good ground to believe there was no Town upon that Mountain till the *Moors* invaded *Spain* under *Tariff*, who gave it the name it has retained ever since. I shall not enter into the detail of the reasons of those Authors, who place *Carteia* at *Tarifa* or *Algezeira*: The true one seems to have



\* Lib. XVI.  
c. 9.

have been their not knowing any other place, which agreed better with the old Accounts of *Carteia*, or where the Ruins of a City, which made so great a Figure, could be buried; the common practice of Authors who describe places they have not seen. This appears to have been the case of most of those, especially *Mariana*; who, had he been in these Parts, would not have been guilty of the oversight he has committed\*, where he places two Bays in the *Streights*, one at *Gibraltar*, and the other at *Tarifa*; which error he was probably led into (as it often happens) by another: For giving into the Opinion that *Tarifa* was the ancient *Carteia*, and finding that City placed in a Bay by *Mela*, he concluded there must be one at *Tarifa*, which is an open Road, and so much exposed, that in the least bad Weather, the smallest Vessels must be haul'd ashore: Which Circumstance alone is a sufficient proof of its not being *Carteia*, by all accounts, a famous Harbour.

Tho' there are very great Ruins at *Algezeira*, they are not such as give any room to believe they are the Remains of a *Roman* City: For neither pieces of Marble, nor Inscriptions are found there, nor any *Roman* Coins. The Circumstance of *Varus* his shutting up the Mouth of the Harbour of *Carteia*, and the distance of 40 or 50 *Stadia* from *Calpe*, are not applicable, either to *Tarifa* or *Algezeira*; and if one of those Towns was *Carteia*, to what City belong those Ruins I have been describing? Since all the ancient Geographers make *Carteia* not only the nearest Town to *Calpe*; but the only one in that Bay. There is better ground to believe *Tarifa* stands on the Ruins of another Town, as I shall endeavour to shew presently.

But before I proceed to a Description of the Coast, it may not be improper to mention some Ruins I saw at *Ximena*; an Inland Town, about five Leagues North from *Gibraltar*, situated on a Rocky Hill; at the bottom of which to the Eastward is a very plentiful Country, washed by the *Josgarganta*, a small Branch of the River *Guadiaro*. On the top of the Hill is the old Town, which by the Arches and Vaults, appears to have been built by the *Moors*. On the right hand Corner of the second Gate of it, there is a coarse Stone with Mouldings on the Edges, which has the following Inscription.

L. HERENNIO HE  
RENNIANO  
L. CORNELIUS HEREN  
NIUS RUSTICUS  
NEPOS EX TESTA  
MENTO POSUIT  
NONIS MARTIIS  
SEX. QUINTILIO CON  
DIANO SEX. QUIN  
TILIO MAXIMO COSS.



*Rodrigo* \* *Caro* says, he saw the beginning of this Inscription in *Bejer de la miel*; but when I was in that Town, I was informed by a very intelligent Person, that there is no *Roman* Inscription in any part of it. The Author of *Cadiz el emporio del Orbe*, when he inserts this Inscription, makes it SEXOVINTILIO CONDIMIO; But the Dash of the Q is very plain, and the other Word seems rather CONDIANO. The *Latin Fasti* in A. U. C. 903. place Consuls.

\*Conv. Jurid.  
de Sevilla.  
c. 13.

SEX. QUINTILIUS GORDIANUS

SEX. QUINTILIUS MAXIMUS.

But the very learned Dr. *Bentley* has observed to me, that the *Greek Fasti* and *Dio* call him *Κονδιανός*, which reading is confirmed by this Inscription.

I have brought with me from this Town a piece of Marble, with the following Words upon it.

AUCTINUS CLEMEN

TIS SIBI

ET SUI BRITTÆ

MATER AN LX

H. S. E. SIT T. T. LEVIS.

I saw another on the Wall of the great Church, which seems to have been the Base of a Statue; The Inscription is as follows.

RESPUBLICA OBEN

SIS E. LO DATO

DEDI. VIT CURAT

LIBE. OR H. REN

NIORUSTICO H. M.

SINILO RESTITUTO

II VIR.

The manner in which the *Moors* have placed these Inscriptions plainly shews the little value they set upon them, and there is so great a plenty of Stone on the Rock where *Ximena* stands, that it is not to be thought they would fetch them for such an use, from any distant place; which induces me to believe a *Roman* Town formerly stood there called O B A.

I do not find any Town of that name in the ancient Authors. *Strabo* † † L. III. mentions Σόνουβα Μαίνοβα ή άλλαι πλείους, which may possibly comprehend Oba. The *Geographia Nubiensis*, in the fourth *Clima*, makes a Town called *Rothan*, the first Station from *Algezeira* to *Seville*, which perhaps may have been this Oba; for it is about a Day's Journey from *Algezeira*, and in the direct Road from thence to *Seville*.



\* L. III. c. 2. *Mariana* \* places the Cave where *Crassus* hid himself, near *Ximena*; the Marks of it, given by *Plutarch*, are common to most others. I went three Leagues in search of it; but the Country People having a notion that there is a Treasure in it, and not being to be persuaded that I would take so much Pains out of pure Curiosity, would not shew me the Way, tho' they acknowledged there were several such Caves thereabouts. I cannot help taking notice of one very odd tho' trifling circumstance. The name of the Person who owns the Land, where those Caves are, is *Pachieco*, which is very near the same with that of the *Spaniard*, who is said by *Plutarch* to have entertained *Crassus* so courteously, Παχιανός. *Hirtius* † mentions a *Spaniard* of Note, in provinciâ *Beticâ*, called *Patiecus*. Quibus præfecit hominem ejus provinciæ notum & non parum scientem, L. Julium Patiecum, which was probably the Roman Name; and therefore I am surprized the Latin Translator of *Plutarch* makes it *Pacianus*.

† De Bell.  
Hisp. princip.

† Nummi Il-  
lustrati.

p. 227.

\* Lib. I. c. 24.

Most of the ancient Geographers describe the Coast Westward of *Carteia* in the following manner. *Julia Traducta*, *Mellaria*, *Bælo fluvius* & *oppidum*, *Portus Bæsippo*, *Promontorium Junonis*, &c. The Itinerary of *Antoninus* makes no mention of *Julia Traducta*, and *Pliny* places it on the *African* Coast, which *Hardouin* † endeavours to account for. *Strabo* calls it *Juliam Jozam*, which as *Bochart* \* observes, signifies the same in the *Phœnician* Language, as *Traductam* in the *Latin*. *Ptolemy* calls it *Transducta*. He places *Barbesula* between that and *Carteia*: But all the other old Geographers put both the Town and River of that Name Eastward of *Calpe*. I saw some Ruins on the East side of the River *Guadiaro*, four Leagues East of *Gibraltar*; which I take to be the remains of the ancient *Barbesula*: For I find in the *Cadiz Emporio del Orbe*, mention made of two pieces of Marble, brought from thence to *Gibraltar*; on one of which was M M B A R B E S U L A N I. I was credibly informed they were used for the Fountain on the Parade. The Letters probably were either sawed off, or turned inwards; for they do not appear. This *Barbesula* is probably the *Barbariana* placed in the Itinerary X. M. P. East from *Carteia*.

*Pomponius Mela*, who was born in those Parts, and, therefore is most to be depended on, gives the following account of the Coast, according to the Edition of *Gronovius*. Sinus ultra est, in eoque *Carteia*, ut quidam putant, aliquando *Tartessus*, & quam transvecti ex *Africâ* *Phœnices* habitant; atque unde nos sumus, *Tingentera*. Tum *Mellaria* & *Bælo*, & *Bæsippo* usque ad *Junonis* promontorium oram freti occupat. The text of *Mela* in this place has occasioned great disputes among the Learned. *Casaubon*, in his Notes upon *Strabo*, says, lego autem — atque unde nos sumus *Tingi* contraria *Mellaria*, aut *Tingi* è regione sita *Mellaria*. Nam *Tingis* factam hîc à *Melâ* mentionem mihi est persuasissimum; primum quidem veterem lectionem spectanti, quæ est, ut dixi, *Cingenteratum*; aut etiam ut in suis libris doctissimus *Elias Vinctus* reperit *Tingentera*; ut jam de eo dubitari non possit. Deinde autem video morem *Melæ* hunc esse, ut locorum in alterâ orâ oppositorum mentionem faciat. Sic alibi: Majorem *Sabæi* tenent partem, ostio proximam, & *Carmanis* contrariam *Macæ*. Nec moveri quisquam debet quod alii *Tingin* *Bæloni* non *Mellariæ*



*lariæ faciunt contrariam. Nam Bælo & Mellaria ita sunt vicinæ, ut mirari hoc nemo debeat. Salmasius, whose opinion is approved by Bochart, makes it Tingis altera, tum Mellaria, &c. and takes the preceding transvecti to denote Julia Traducta. Casaubon seems to have been once of the same Opinion. Sed a Strabone stare Ptolemæus videtur, qui in hac Hispaniæ orâ oppidum quoddam memorat cui nomen Transducta, in quod scilicet collocati fuerint isti, de quibus nunc loquitur Strabo; & de quibus dubitari aliquando, an hæc Mela verba essent accipienda, In eoque Carteia, ut quidam putant, aliquando Tartessus; & quam transvecti ex Africâ Phœnices habitant. Nam videbatur satis apertè Transductam Ptolemæi  $\tau\epsilon\iota\sigma\epsilon\upsilon\sigma\epsilon\upsilon$ . Nunc iis assentior qui ad Carteiam ea referunt. The opinion of Salmasius seems to be the most probable; for Bælo and not Julia Traducta is said to be over against Tingis. Marcianus Heracleotes makes the two former about 250 Stadia distant from one another, and Mellaria is generally placed between them; therefore they could not be so near one another, as Casaubon insinuates. Tho' Carteia was originally founded by the Phœnicians, it had been erected into a Roman Colony long before Mela's Time, and therefore he could not very properly say Carteia, quam Phœnices habitant; and had he intended to take notice of the Founders of that City, it is probable that one, whose Style is so pure and accurate, would have made use of another word, or at least another Tense. Besides, if Julia Traducta, according to Casaubon, is not meant by that passage, it must have been entirely omitted by Mela; which is very unlikely, considering he was Born in or near it; and that it is mentioned by Strabo, who lived before him, and Ptolemy and several others who were after him; and appears to have been remaining at the time the Vandals were in possession of Spain; for Greg. Turon. Lib. II. says *Prosequentibus Alamannis usque ad Traductam, transito Mari, Vandali per totam Africam ac Mauritaniam sunt dispersi.* The Letters of *Tingi altera* come nearer the *Tingentera* of Elias Vinetus, and the *Tinge Hiera* of Gronovius, than Casaubon's *Tingi contraria* or *Tingi è regione sita*. The & and the *atque*, by making the stop at *Tartessus* instead of *Habitant*, may very well relate to the same place; and it is not improbable that Mela was desirous to illustrate the obscure place of his Birth by a Periphrasis, and a name of some *Eclat*; tho' it has hapned, the method he took to do Honour to it, has been the occasion, that we are in doubt even of its name.*

I met with two Medals of *Julia Traducta* among the Brass Spanish Coins; but as I cannot ascertain where they were found, I will not pretend to form from thence any judgment of the Situation of the Town to which they belong: But I presume in matters so dark, a conjecture may be offered. It does not seem very improbable, that *Julia Traducta* stood where *Tarifa* is at present: The Spanish Authors reckon that Town to have been built by *Tarif* at his second coming to Spain. I cannot see what could invite him to settle on a Spot, which has neither the convenience of a River, nor a Harbour, and is commanded by a rising Ground; unless he found some Tenements standing, or Ruins to serve for Materials to build. I have several Roman Coins that were found there after great Rains, in the Common Sew-



er; which is some slight inducement to believe it was formerly a *Roman Town*.

About a League and half to the *West* of *Tarifa*, is a place which goes now by the name of *Val de Vaca*: The Country People have a Tradition among them, that it was once a considerable Town, since swallowed up by the Sea. There is a small Brook called *El Arroyo de Juan Francisco*, which serves to turn some Mills, that a Priest of that Name was encouraged to build there, by finding an ancient Stone Chancel for the Water. I saw some other small Ruins, and was credibly assured there are visible remains of an old Town a good way under Water. There is a Shoal almost off this place, that runs pretty far in the Sea, on which a *Hamburgher* was lost some Years ago. Perhaps *Mellaria* stood hereabouts.

Wherever it was, the Ruins of it must be a considerable way in the Sea, if credit is to be given to *Pliny*, who upon the Testimony of one Born there, reckons only five Miles from thence to *Afric*. Lib. III. whereas it is at present five Leagues over at the narrow Part. *Casaubon* is mistaken in that Note on *Strabo* L. II. where he says, *At Maris Mediterranei ostium vix LXX Stadia latum est ἡ-σενώτατον*.

I cannot help observing that the best Honey in all *Spain* is made in these Parts, and that the same cause to which the ancient *Mellaria* ow'd its Name, still subsists, and has given a modern Appellation to several places hereabouts, as *Playa de Orimel*, *Rio de la Miel*, *Bejer de la Miel*. The latter of these is generally reckoned by the *Spaniards* to be the old *Mellaria*, for no other reason, that I can see, but the Name. For it is at least two Leagues from the Coast of the Streights, and, by what I could judge when I was on the Spot, as near the Ocean, and therefore may as well be ascribed to the one as the other. Whereas *Mellaria*, according to all the old Geographers, was situated on the Sea-side in the Streights, and is reckoned by *Pliny* the nearest Town to *Afric*; a plain proof that it was not what is now *Bejer de la Miel*.

About a League and half further *West*, in a small Bay, there are very great Ruins, which appear evidently to be the remains of a *Roman Town*. A League *Eastward* from that place, upon an Eminence, are to be seen the Quarries from which the Stone was fetched for building it; and all the way from thence are large remains of an Aqueduct, of which in some places there are entire Arches still standing. Among the Ruins of the old Town, I saw the Body of a *Roman Statue* of fine Alabaster, something bigger than the Life. Our Guide said his Father had seen it entire; but as it was an Idol of the *Gentiles*, they, like good Catholics, had broken it in pieces. He likewise told us that Urns of old Coins had been found there; but not being Current in *Spain*, they had thrown them away. The place is called *Balonia*. It is over against *Tangier*, and frequently infested by the *Moors* from thence; on which account it is uninhabited. A small River, called *Alpariate*, runs by it: all which circumstances correspond with the ancient accounts of *Bælo*. I have a Medal that was given me at *Tarifa*, with the following Letters upon it BAILO, which probably belonged to this City, called







Plate V. Part IV. P. 61.





called by *Ptolemy* Βαίλων. *Martianus Capella* Lib. VI. mentions it under the name of *Velonenfis Bætica Civitas*. The Itinerary of *Antoninus* places *Bælo* VI. M. P. West of *Mellaria*, which is about the distance of these Ruins from *Val de Vaca*.

About five Leagues farther is the Cape of *Trafalgar*; the sight of which immediately brought to my mind *Mela's* description of it. *Illud jam in Occidentem & Oceanum obliquo jugo excurrans, atque ei, quod Ampelufium esse dixeramus, adversum, &c.* Near the Capes Point are the Ruins often mentioned by the *Spanish* Authors, under the name of *Aguas de Mecca*. I was not there, but was assured at *Bejer de la Miel*, that there were still some Ruins on the Shore, and more in the Sea, that run all along under the Cape; particularly remains of a Mole, which must have made it a tolerable Harbour. These Ruins seem to be the remains of old *Bæfippo*\*. *Mela* *Bæfippo usque ad Junonis promontorium, oram freti occupat.*

\* *Plin. L. III.*  
*Portus Bæ-*  
*fippo.*

The placing of Watch-Towers along the Coast of *Spain* to alarm the Country, upon any Descent, seems to have been a practice of a long standing. *Livy* † *Multas & locis altis positas turres Hispania habet, quibus & speculis & propugnaculis contra latrones utuntur: inde primo, conspectis hostium navibus, datum signum Asdrubali est, &c.*

† *L. XXII.*  
*c. 19.*

X. The Stone was found at *Elstone* near *Newark, Nottinghamshire*: It is a blue Clay Stone, the same as (and undoubtedly came from) the neighbouring Quarries of *Fulbeck*, or thereabouts, upon the Western Cliff of the long Tract of Hills extending quite through the adjacent County of *Lincoln*. It lay, time out of mind, at the side of a Well near the Parsonage-House, where it had serv'd for a Landing-place to those that drew Water; but upon removal, the Under side exhibited this unusual Form, and was laid up by Mr. *South*, the Rector, in his Garden for Curiosity-sake. Where the remaining part of the Stone, which contain'd the Upper-part and Continuation of the *Skeleton*, or that which was the other side, and tally'd with it, may be, is now utterly unknown: but upon view, I am persuaded, it cannot be reckon'd Human, but seems to be a *Crocodile* or *Porpoise*. There are Sixteen *Vertebræ* of the Back and Loyns very plain and distinct, with their Processes and intermediate Cartilages. Nine whole or partial Ribs of the Left-side, the *Os Sacrum*, *Ileum in situ*, and two Thigh-Bones displac'd a little, the Beginnings of the *Tibia* and *Fibula* of the Right Leg; on one Corner there seem to be the *Vestigia* of a Foot with four of the five Toes, and a little way off an entire Toe, now left perfect in the Stone: there are no less than Eleven Joints of the Tail, and the Cartilages between them of a White Colour distinguishable from the rest. We should impose upon our Senses, to question, whether these be the real Reliques of an Animal; for the very Bones themselves are now to be seen as plainly, as if preserv'd in an *Ægyptian* Mummy. Its remarkable, that all the Stone Pits about the Country whence this came, abound with prodigious Quantities of Shells, and the like, and the greatest part of the Substance of the Stone is a Composition of them. There are many Accounts of them in the *Transactions*, and this Stone has many.

*The Impression*  
*of a Skeleton*  
*in a Stone, by*  
*Dr. Stukeley.*  
*n. 360. p. 963.*

*Plate 5.*



many Shells of different kinds in it. Sir *Hans Sloan* has a Fish-Skeleton, amongst his immense Treasure of Curiosities, found near this Place, given by the Duke of *Rutland*. If we look upon a Map of the Country, and observe the *Lincolnshire Alps* which I spoke of before, how they run 50 Miles North and South, and on the West side are steep and rocky, we may see the Reason why these Quarries should be so stufed with them; for it is just to conceive, that upon retiring of the Waters of the Deluge from the Superficies of this Country, into the Eastern Seas, these heavy Bodies met a full stop, and were intercepted by this Cliff, which has retain'd such vast Quantities of them ever since: whilst those which fell upon common Mold are mostly rotten, and now lost.

Sir *Isaac Newton's* Doctrine of the Attraction of the Particles of Matter, according to the Quantity of its Solidity, Proximity, and Surface, especially that it is infinitely greater in the point of Contact, upon which depends its Cohesion and all the Varieties of Physical Action, will easily direct us to a Notion of Petrification. We learn how a proper Degree of Heat or Cold, Moisture, Motion, Rest and Time, promote this Principle, from the common Experiments of Crystallization and Freezing even before the Fire, and in many Chymical Mixtures. Whence we cannot be ignorant of Stone growing in the Quarries gradually, not by any fancied Vegetation, tho' there is something like it in Corals, but generally by Apposition of Parts to Parts, as is notorious in the *Fluors* of subterraneous Grotts and Caverns. So that we have no reason to doubt but what was Clay, Sand, or Earth 3000 Years ago, may now be Stone or Marble, according to the Proportion of Concurrence of such mentioned Causes. This will persuade us that the now barren and rocky Plains of the Countries of *Syria*, *India*, and *Arabia*, are owing to Natural Causes, as well as an immediate Curse of God for the Disobedience of its ancient Possessors his peculiar People, because the same is observable of the famous Countries of *Greece* and *Africa*, warm Regions so renowned for Fertility in antient Authors. Wherefore there may be some likelihood in the Opinion of those who think that in many Ages the whole Face of the Globe may become one great Rock. Dr. \* *Plott*, gives an Account of a *Tumulus*, now a perfect Mount of Stone: and upon *St. Vincent's* Rock near *Bristol* are Fortifications now become solid Cliff. I remember, about six Years ago, Mr. *Ralph Widdrington*, Brother to the Earl of that Name, shew'd me many human Bones taken from whole Skeletons, with British Beads, Chains, Iron Rings, Brass Bitts of Bridles, and the like, which were dug up in a Quarry, near the Seat of the Family, at *Blankney*, *Lincolnshire*; which very probably was plain Mold when these old Corpses of the *Britons* were interr'd; and since then I saw many human Bones and Armour, with *Roman* Coins, *Fibulae*, &c. found in a Stone-pit in the Park at *Hunstanton*, *Norfolk*; which were conjectured to have been buried in Earth after a Battle. From whence we may judge it a vulgar Mistake, when in the Ruins of old Castles and Walls, we admire the Tenacity of the Mortar, and are apt to praise our Ancestors, for an Art which we suppose now lost; when doubtless the Strength of the Cement is owing

\* *Hist. of Oxfordshire.*



to the Length of Time: and in future Ages our Modern Buildings may obtain the same Judgment.

From all which Instances, I only desire to infer the antient state of these Cliffs, where this Sceleton was, and Shells are daily found, intimately mixt in the Substance of the Stone, to have been formerly of a softer Consistence, capable of admitting them into its Bowels, and to have immur'd them as part of itself; and that Earth which now is manageable by the Plough, may possibly in time assume the same Density, at least very little below the Surface; for in this very Cliff the upper *Strata* are yet Clay, growing harder as deeper. What Creature this has been, for want of a Natural History of Sceletons, we cannot positively determine; but generally find the like to be amphibious or marine Animals. Why such rather than many others, should chance to be thus entomb'd, may be thought, because they were able much longer than Terrestrial Animals to live in that World of Waters, even till they began to abate and fall away into their destin'd Receptacles; so that while the Bodies of the rest, soon perishing, were corrupted, and their Bones separated and dispers'd much earlier; this Sceleton, with others of its like, fell entire into the Fissures of this Bed of Clay, which has since turn'd into Stone.

XI. Dec. 5. 1699. One digging in a Ground of Sir *John Eyles*, near the *Devizes* in *Wiltshire*, about two Foot under the Surface, took up a Pot of a pretty narrow Mouth, about 18 Inches in its greatest Circumference, and 10 Inches deep; the Clay of a bluish Color, and of such strength and compactness, as it seem'd little injur'd by time; contain'd several hundred Pieces of ancient *Roman* Coin, by different Emperors, with great variety of curious Figures, and Devices on the Reverses. The most were of Copper, and but very few of mixt metal. A great number had the Characters effac'd, but the legible were the fairest I ever saw. 'Tis observable many of the said Pieces were gilt with Silver, which on several that I have seen seem'd very little impaired, tho' they had lain under ground for some Ages, and appear'd as much Canker'd as the rest. I have among several others two very odd Pieces; one of them gilt; on one side a Womans face, with this Inscription *SALONINA AUG.* the other a Woman's face, part of the Inscription *HE-LENA*, the remaining Characters I cannot decypher. On the Reverse *PAX PVBLICA*. This latter is of a mixt metal resembling Brass, of the largeness of a Silver-penny ungilt. About the same time, and within a few yards of the same place, were found some Pots, made of a very firm and durable Clay, of pretty strange Figures, and different Earth, two of which I have by me, one of them somewhat resembling an Oyster-pot, is about  $\frac{3}{4}$  of an inch thick, 9 inches in Circumference, and  $5\frac{1}{2}$  in depth, and for strength and compactness, scarce to be paralleled by any now made; the other is one half of the Pot, in which the Treasure was found. There is likewise another Pot in the hands of another Person, of about 11 Inches circumference, and  $3\frac{1}{3}$  deep, wherein was found a whitish Powder, supposed by the owner to be the ashes of humane Bones, and therefore

*Roman Antiquities found near the Devizes, by Mr. Clark. n. 268. p. 758.*



fore by him taken to be an Urn. But on Experiment made on the supposed Bone ashes, by putting a small portion into the bowl of a clean Tobacco-pipe made glowing, it soon appear'd to the contrary; for the said matter immediately kindled into a bright flame, and sent forth a scent somewhat like that of hoofs or horns, tho' it had a very fragrant smell before. I am told moreover, that 'tis very usual in these parts of the Kingdom to find various sorts of ancient Earthen Ware, some exceeding *China* in fineness. I remember I once saw a Piece in the hands of an Apothecary in *Caln*, that had been finely gilt with Gold.

Antiquities  
and Inscriptions lately  
found in Scotland and Ireland. By Mr. Lhwyd.  
n. 269. p. 790.

XII. Fig. 3. A Roman Inscription from *Hadrian's Wall* by the Kirk of *Kilpatrick*. *Imperatorii Cæsari Tito Ælio Hadriano Antonino, Augusto, Pio, patri patriæ, vexillatio legionis sextæ victricis p. fossam per ter mille & DCLVI. passus.*

4. An Irish Inscription on a stately Cross, carv'd on all sides. 'Tis at *Munster Boys*, near *Drogheda*.

The two Cats and the Inscription we know not what to make of.

5. Another at the Abbey of *Cluinmacnos* in the County of *Roscommon*.

{ Or *Angilla Giarain*.

{ Pray for the sake of *Giarain*.

Plate 4.

6. A *Pictish* Monument near *Edinburgh*, *In oc tumulo jacet veta F victi*. This the common people call the *Ket stean*. Note, that the *British* names beginning with the letters *Gw*, began in *Latin* with *v*, as we find by *Gwytheyrn*, *Gwytheuir* and *Gwythelin*; whom *Latin* Writers call *Vortigernus*, *Vortimarus* and *Vitellinus*. So I suppose this persons name was *Gweth* (or *Geth*) of which name were divers Kings of the *Picts*; whence the vulgar name of *Ket-stone*.

7. A Monument of *Kadran* Prince of *North Wales*, about the midst of the sixth Century. *Catamanus Rex sapientissimus opinatissimus omnium Regum*. This is above the Church door of *Lhan Gudwaladr* in *Anglesey*, and is a confirmation of the Authority of *Geofrey of Monmouth*, who makes Prince *Caduan* the Grandfather of our last King *Cadwaladr*.

8. A French Inscription at *Bullifont* Abbey in *Ireland*. *Phelip de la Cha-pele Ghyt ici, Deu de sa alma eyit mercipte*.

9 & 10. Two Irish Inscriptions on the Tombs of *Scottish* Princes at *Y Colum Kil* in the *Hebrides*. The 1st signifies, Pray for *Eogain* (or *Eugenius*) the 2d, Pray for *Ilfata*.

11. An Arrows Head of Flint, commonly call'd *Elf-Arrow* throughout *Ireland* and *Scotland*, where they are fully perswaded the *Elves* often shoot them at Men and Beasts. This is set in Silver, and worn about the Neck, as an Amulet, against being *Elf-shot*.

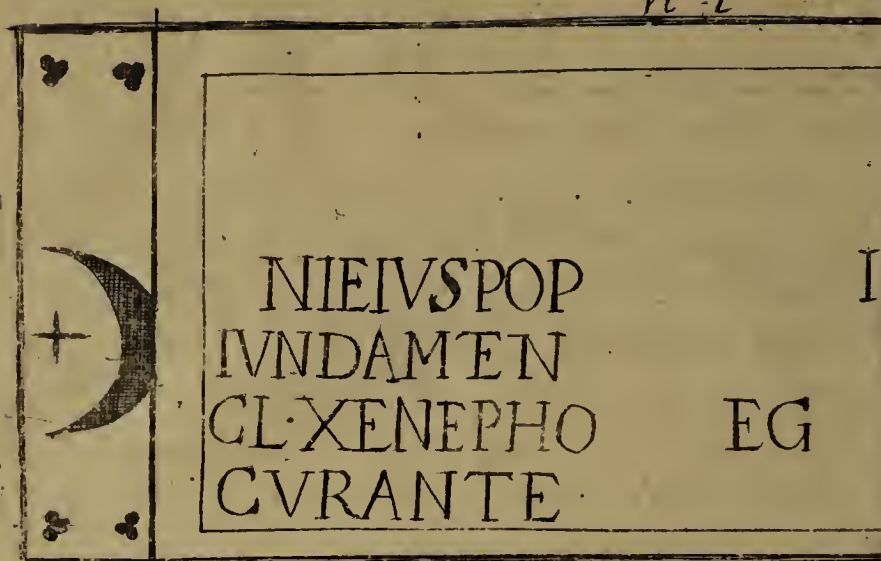
— In *Yorkshire*. By Mr. Hunter. n. 278. p. 1129.

XIII. 1. A Roman Station at a Village call'd *Ebchester* in the County of *Durham*, has been surrounded with a Wall of hewn Stone, and seems to have been an exact square of about 200 yards on every side: here have been Suburbs

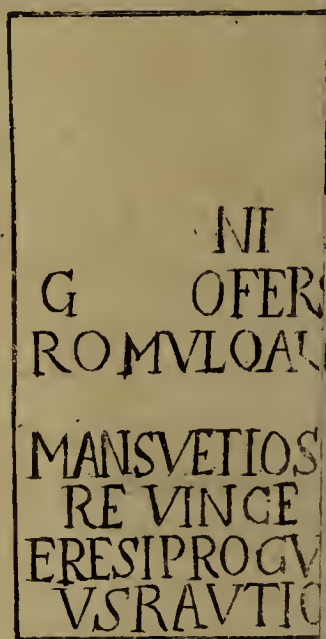
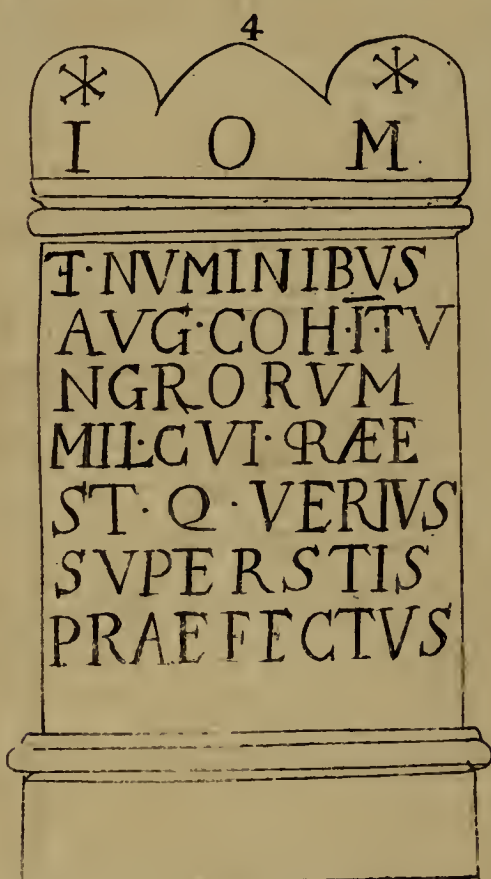




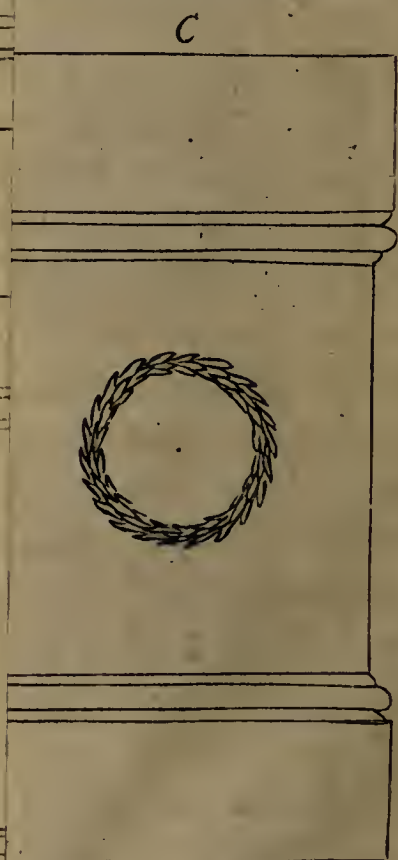
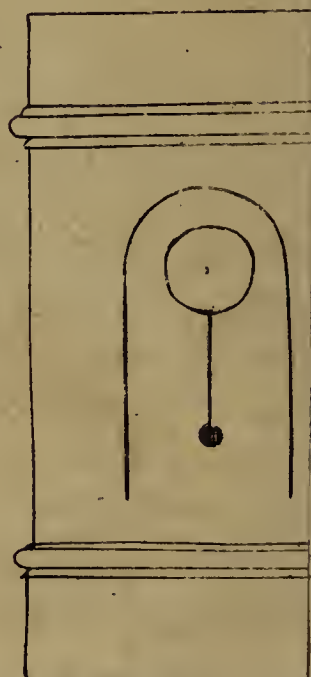
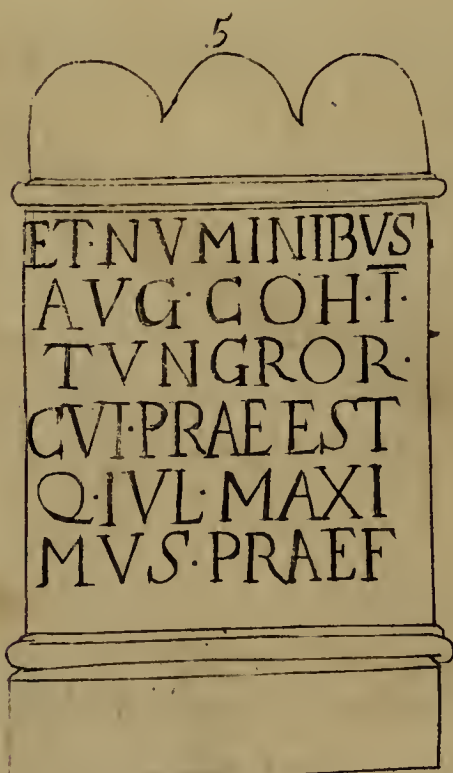




5



IMPERATC  
MAVRELIOAN  
POTESTATI





Suburbs towards the West, South, and perhaps East, of a considerable extent: but towards the North the Wall has stood upon the top of a steep bank, under which runs the River *Derwent*, in which not long since was found a long Altar, but its Inscription is defaced: as also a lesser Stone, with this word HAVE, not on the front, but one side; this Stone is in my possession. There is another (which is used as a Grave-stone) it lies before the Church-door, which by the Engraving of a Man from the Breast upwards in a *Roman* dress, seems to have been *Roman*. These are all the Stones I can meet with that have ever had any *Roman* Inscription. The Inhabitants all confess they have dug up many Inscriptions, but (because no body there understood them) they always broke them: and they add, that in most places they plainly discern two different foundations of ruin'd Houses, and most Stones thus dug up are ting'd of a deep red colour, undoubtedly by Fire. That part of the Village which stands within the Walls is call'd the *Mains*, and there are the most ruins: here are many Tiles dug up of a red Clay, but not one entire.

About twenty years ago, some out of a Project of finding a Treasure, and prompted forward by the Tradition of an Iron Gate, supposed to be about eighty yards from the place where they made the first attempt, began to undermine an old Foundation still visible on a Hill side, and after they made a small progress found a considerable quantity of melted Metal, which at first view they supposed had been Silver, but upon a second examination it proved to be no more than Pewter, which discouraged the Undertakers so much that they desisted from further Enquiry.

2. These Inscriptions, I doubt not, will find a favourable reception; tho' 'tis to be confess'd, some of them are not so perfect as I could have desired: and most of the words in that mark'd Tab. I. No. I. are so artificially erased, that I am apt to believe it has been thus defaced upon some Revolution in the *Roman* Government. This, (with several more, beautify'd with Inscriptions and Engraving, but which are now taken away) was dug up some time ago in a Field called the *Bower*, it is about half way between the *Roman* Wall and South *Tine*, and is near two miles West from *Busie gap*; here has been a *Roman* Garrison kept, it has been surrounded with a single Wall, and is square; 'tis nothing now but heaps of Stones, overgrown with Bushes.

Plate 6.

Some years ago, on the West side of this Place, about fifty yards from the Walls thereof, there was discover'd under a heap of Rubbish a square Room strongly vaulted above, and paved with large square Stones set in Lime; and under this a lower Room, whose Roof was supported by rows of square Pillars of about half a yard high: the upper Room had two niches, like (and perhaps in the nature of) Chimneys on each side of every corner or square, which in all made the number sixteen; the Pavement of this Room, as also its Roof, were tinged black with Smoak. The Stones used in Vaulting the upper Room have been marked as our Joyners do the Deals for Chambers; those I saw were number'd thus, X. XI. XIII. The man who farms this ground presented me with a winged Image; it has been about three Inches long, but now wants the Head and Feet.



The other Inscriptions were all found near the *Houfsteads*, a Place so called from the abundance of Ruins; this is about half a mile from *Busy-gap* towards the West, and is placed just within the *Roman Wall*; among the Ruins I found several Pedestals, two or three Pillars, two Images, but somewhat defaced. The Stone Tab. i. No. 2. lies against a Hedge a quarter of a mile from this place. That marked Tab. i. No. 3. tho' only part of an Altar, I thought worthy transcribing, because I am in hopes of recovering the other part as soon as Harvest is over, this part having been tore up by the Plough. The two Altars Tab. i. No. 4. and 5. are very legible; I found them on a rising ground South of the *Houfsteads*; they call it *Chapel-bill*, and suppose a Foundation, which is visible there, to have been a Chapel; and say that within the memory of their Fathers they used to bury their dead here.

3. I found *Watlingstreet* very visible from near *Ebchester* almost to *Corbridge*, which is about seven miles: here beyond expectation I met with this Altar marked Tab. 2. a. I drew both sides of it, b. and c. as well as I could; on the top it is hollow at least eight inches deep: the Inscription is all legible except the second and last letters in the first line, the second and third in the third line, and the third in the last, which are a little doubtful; the Altar is at present in the Church-yard, it has been there a long time.

The Fragment d. I found in the front of a House in the same Town, it is still sufficient to shew the real value which ought to have been set upon the Inscription, if it had been entire: I was very sensible at first view that History would receive some light from this, if perfect; and in order to retrieve the remaining part (which I am perswaded is still buried in the Ruins) I profer'd any reasonable gratification to whosoever would undertake to procure it for me, but had the ungrateful answer, that the person who found this being dead, no other body could go to the place where it was formerly digged up. This, plainly shews the irretrievable loss Learning sustains by the sluggish neglect of some Men.

From hence I travell'd upon this Street almost to *Resingham*; it is very visible all this way: about a mile South from *Resingham* there is a Pillar of about eight foot in length, which has stood by the way side, but is now fallen: At this Place I was shewn the Inscription c. in a Wall on the inside of a House, I got a Medal which was found here a year ago, 'tis a Brass one, the Emperor's name worn out, AVG PIVS very legible, but by the figures of other Medals I take it to be *Antoninus*; on the Reverse a Wolf, without any Inscription.

The next *Roman Town* I visited was *Rocheſter*; *Watlingstreet* is very visible some part of it, but how far I cannot tell, not having traced it. I found the Altar f. near this place. I cannot say this is the largest, but think it has been one of the best fortified Places the *Romans* have been Masters of in the North: and indeed it stood in need of being so, since it was not only a Frontier Town, but, as *Maestricht* is at present, was surrounded by Enemies.

From



From this Place I return'd to the *Roman Wall* at *Carrow*, between which and *Walwich* the Wall has been repair'd, and fronted with its old Stones again, upon which I found the Inscriptions Tab. 2. No. 1, 2, 3, 4, &c.

XIV. There was found at Mr. *Mont. Giles's* a remarkable Lead Coffin, which by the Circumstances, seems to have been for a Person of Quality; 'twas nine Foot deep in the Ground, whereof 6 were Clay, and 3 a black Earth; the Lead Coffin, which was about seven Foot long, was inclos'd in a prodigious strong one, made of Oak Planks about two Inches and half thick, which, besides the Rivetings, were tack'd together with Brags and great Iron Nails, some of which I pull'd out of the Planks, and have by me; they are four Inches long, the Head not Diewise as the large Nails now are, but perfectly flat, and an Inch broad: I have one somewhat different; the Nail itself is half an Inch broad and thin, somewhat in form of a Wedge, and the Head not round as the others, but somewhat like the modern Draw-nails; but those old ones are generally square, the four sides of an equal breadth. Many of them are almost consum'd with rust, and the outsides of the Planks, but the Heart of the Oak is firm, and the Lead very fresh and pliable; whereas one found about a Year ago, is brittle, and almost wholly consumed, having no Planks to guard it: But what I was most surprized at, was, that the Bones should be entire, tho' probably interr'd 1500 Years ago; for 'tis above so many Centuries since their Custom of Burning gave place to that more natural of Burying their Dead; which, according to Monsieur *Muret*, was re-introduced by the *Antonines*. I have a Thigh-bone (which is wonderful light) and the lower Jaw, which was furnished with all the Teeth, but some of them are since stoln out; but tho' the Bones are light, the double Coffins were so heavy, that they were forced to drag them out with a Team of Horses.

*A Leaden Coffin found near York, by Mr. Thoresby. n. 296. p. 1864.*

XV. 1. About 40 Perches distant North from a ruinous Wall, call'd the *Old-Work of Wroxeter*, once *Uriconium*, a famous City in *Shropshire*, in a piece of Arable Land, in the Tenure of Mr. *Bennet*, he observed, that altho' these Fields had formerly been fertilized, and made very rich by the Flames and Destruction of the City, yet a small square Parcel thereof to be fruitless, and not to be improved by the best Manure. He then guessing the Cause of Sterility to be underneath, sent his Men to dig and search into it; but the Soil being then unsown, caus'd them to mistake, and search in a wrong place; where they happen'd upon bottoms of old Walls, buried in their own Rubbish, (being such are often found in those Fields;) and the Inhabitants digging one of them up, for the benefit of the Building-Stone, were thereby guided to the Western-Corner of the said unprofitable Spot of Land: Where they found (near the Foundation) a little Door-place, which, when cleansed gave entrance into the Vacancy of a square Room, walled about, and floor'd under and over, with some Ashes and Earth therein. This was built in times past (as some suppose) for a *Sudatory* or *Sweating-house* for *Roman Soldiers*; being set with 4 Ranks of small Brick Pillars,

*A Roman Sudatory in Shropshire, by Mr. John Lyfter. n. 306. p. 2226.*



8 Inches square, and laid in a strong sort of very fine Red Clay; each Pillar being founded upon a Foot square Quarry of Brick; and upon the head of every Pillar was fixed a large Quarry of 2 Foot square, hard almost as Flint, as most of those *Roman* Bricks are, and within as Red as Scarlet, and fine as Chalk. These Pillars were to support a double Floor, made of very strong Mortar, mixed with coarse Gravel, and bruised or broken Bricks: The first of these Floors was laid upon the large Quarries, and when dry, the second Floor was laid upon it.

But first there was a Range or Rank of Tunnel-Bricks, fixt with Iron-Cramps up to the Wall within, with their lower ends level with the under sides of the broad Quarries, and their upper ends with the surface of the upper Floor; and every Tunnel had alike two opposite Mortice-holes, one on either side, cut through for a cross passage to disperse the Heat amongst them all.

Fig. 1. A. B. C. D. is the Ground Plat, on which the Pillars of Brick stand.

Plate 7.

Fig. 2. E. F. is one of the said Bricks; which are in number 24.

Fig. 3. G. H. I. K. is the Ceiling of square Tiles, which lye upon the Heads of the square Pillars.

Fig. 4. L. M. N. O. P. Q. is the Sweating-house, in Perspective, shewing in part the Manner of the Floors and Pillars as they were placed.

Fig. 5. R. S. T. U. is the double Floor, whose upper surface lies even with the tops of the Flews in the perspective Draught.

Fig. 6. W. X. is one of the Flews, or Tunnel-Bricks.

Remarks by  
Dr Harwood.  
ibid. p. 2228.

2. Certainly *Wroxeter* was one of the most considerable Military Stations or Colonies the *Romans* had in this Island; the City Wall, as appears from a Survey taken by Mr. *Lyster*, was not much less than three Miles in Circumference; 'tis not improbable, but that it was founded by *Suetonius Paulinus*, or after by *Agricola*, in their March to subdue *Mona*, now *Anglesey*. I have been inform'd by Sir *Christ. Wren*, that he discover'd the remains of such another *Hypocaust*, when they were laying the Foundation of the King's House at *Winchester*.

of Wroxeter, by Mr. William Baxter. ib. p. 2230.

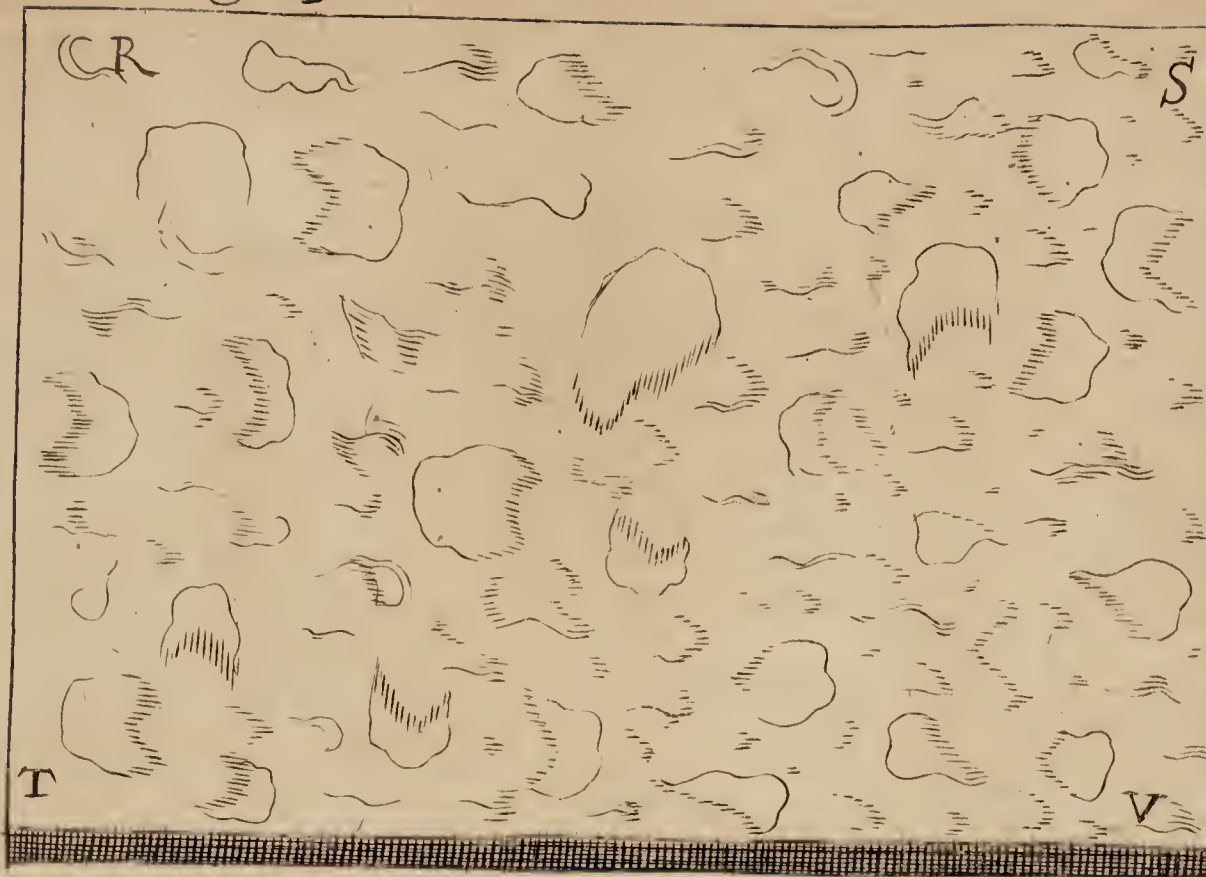
XVI. *Veroconium* Antonini, atq; Ptolemæi *Ravenati* Monacho prodigiôsè, ut ferè omnia, *Utriconion* est *Cornoninorum*, pro *Vericonium* *Cornoviorum*, undè discimus *Veroconium*, seu *Vericonium*, fuisse *Cornaviarum*, sive *Cornoviorum* caput. Saxonibus *Urecenceaster*, nobisque hodiè correptè *Wroxeter* est pro *Wetroscester*. Nomen dedit hæc Urbs vicino monti *Wreken* appellato, atque etiam vicino vico *Wrocwandin*, quod *Arcem* sonat *Veroconiensem*. Nennio Britannno *Caer urnach* appellatur; verum corruptè puto pro *Caer ùar na ùag*, sive *Civitas* ad *Cervicem aquæ*. De *Urnaco* enim Gigante, de quo crepant Britannorum Fabellæ, piget quicquam referre. Neque sanè *Veroconium* ipsum quicquam aliud sonat, quàm *ùaro conüi*, sive *Cervix aquæ Principis*, vel *Sabrianæ*. Nam & *Cond* & *Kend* Britannis erat pro *Capite* & *Principe*. Idem igitur *Condüi*, sive *Conüi* quod & *Savrian*, sive *Amnis Regina*. Extat etiam antiqui operis insignis *Parietina*, accolis vocati *Theoldwork*, sive *Antiquum*



Fig. 7.



$f = 5 -$



$f = 3 -$

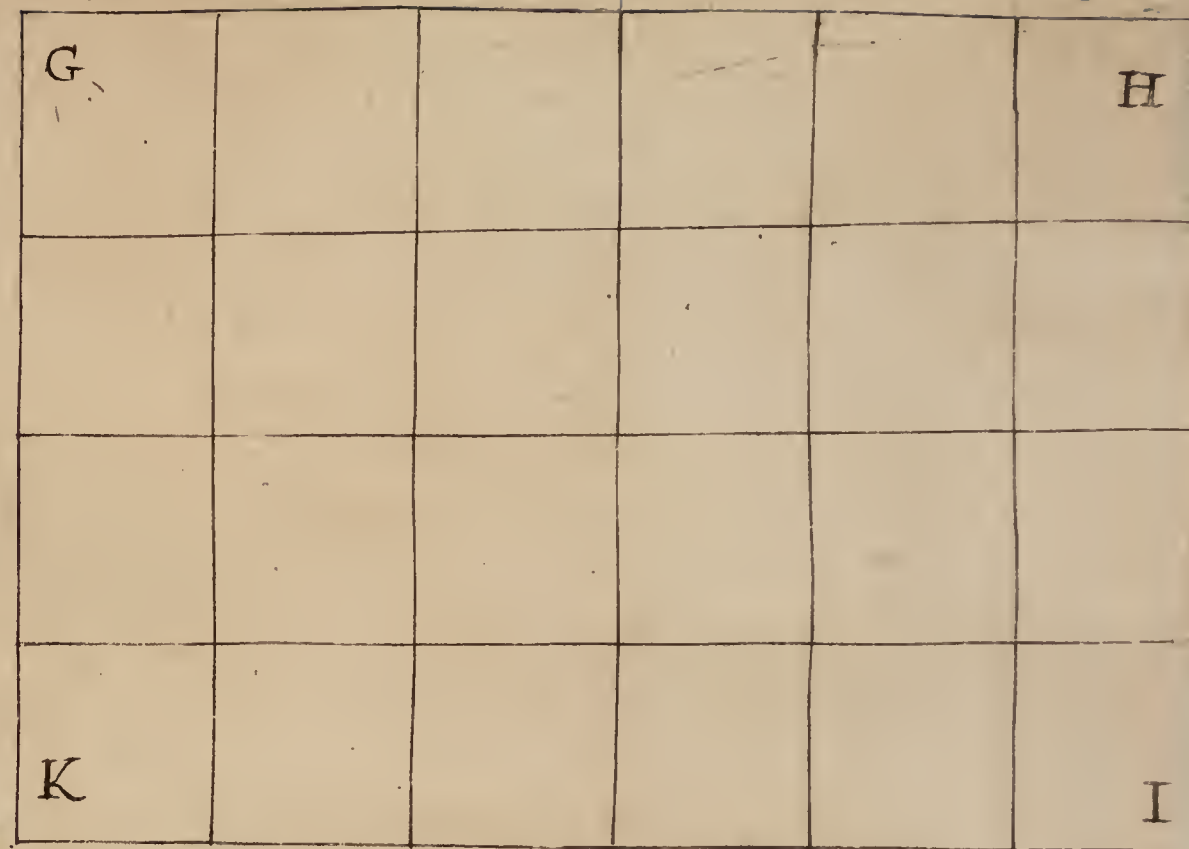
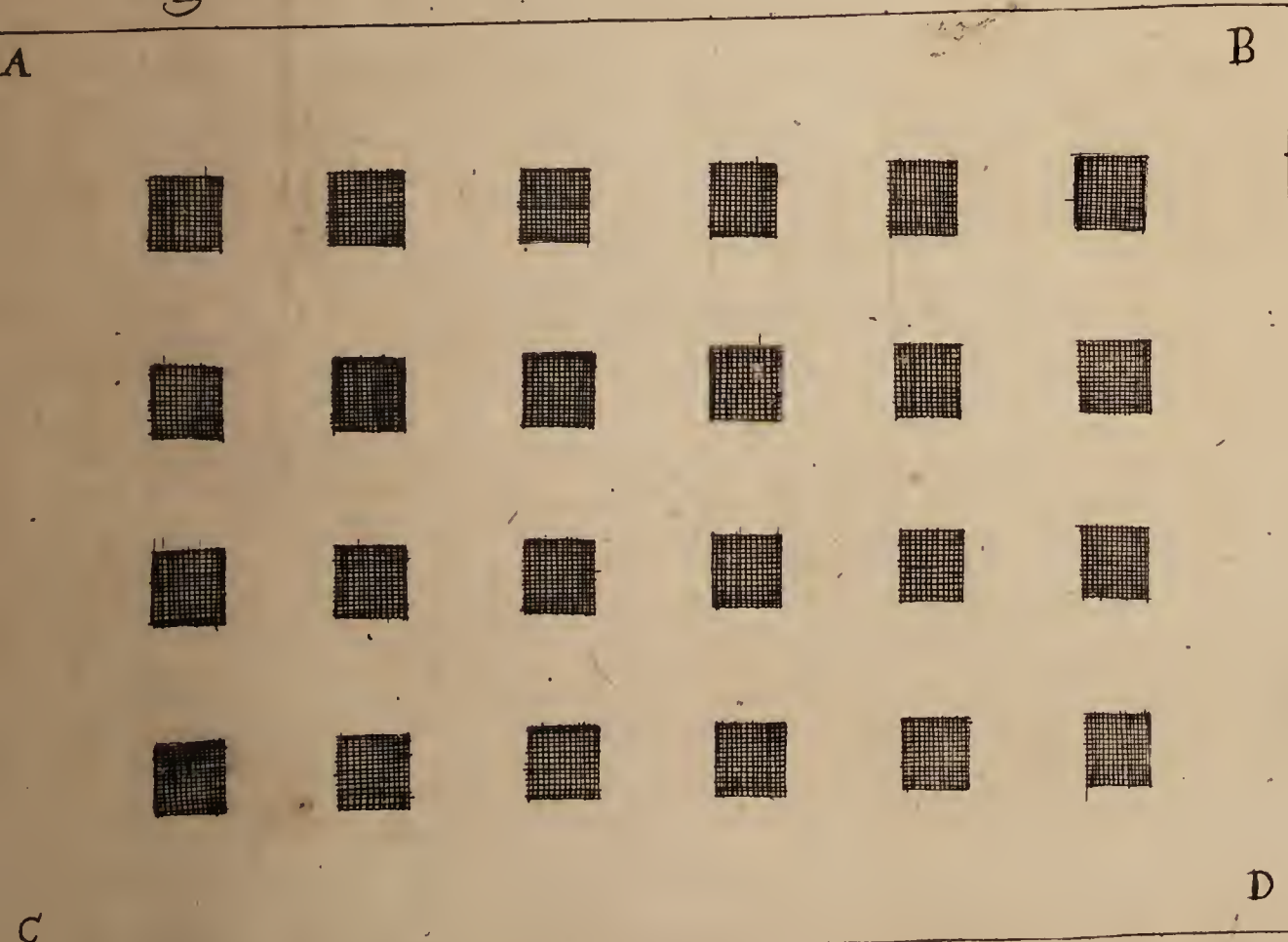
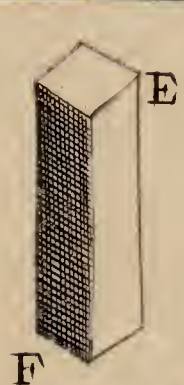


Fig. 1.

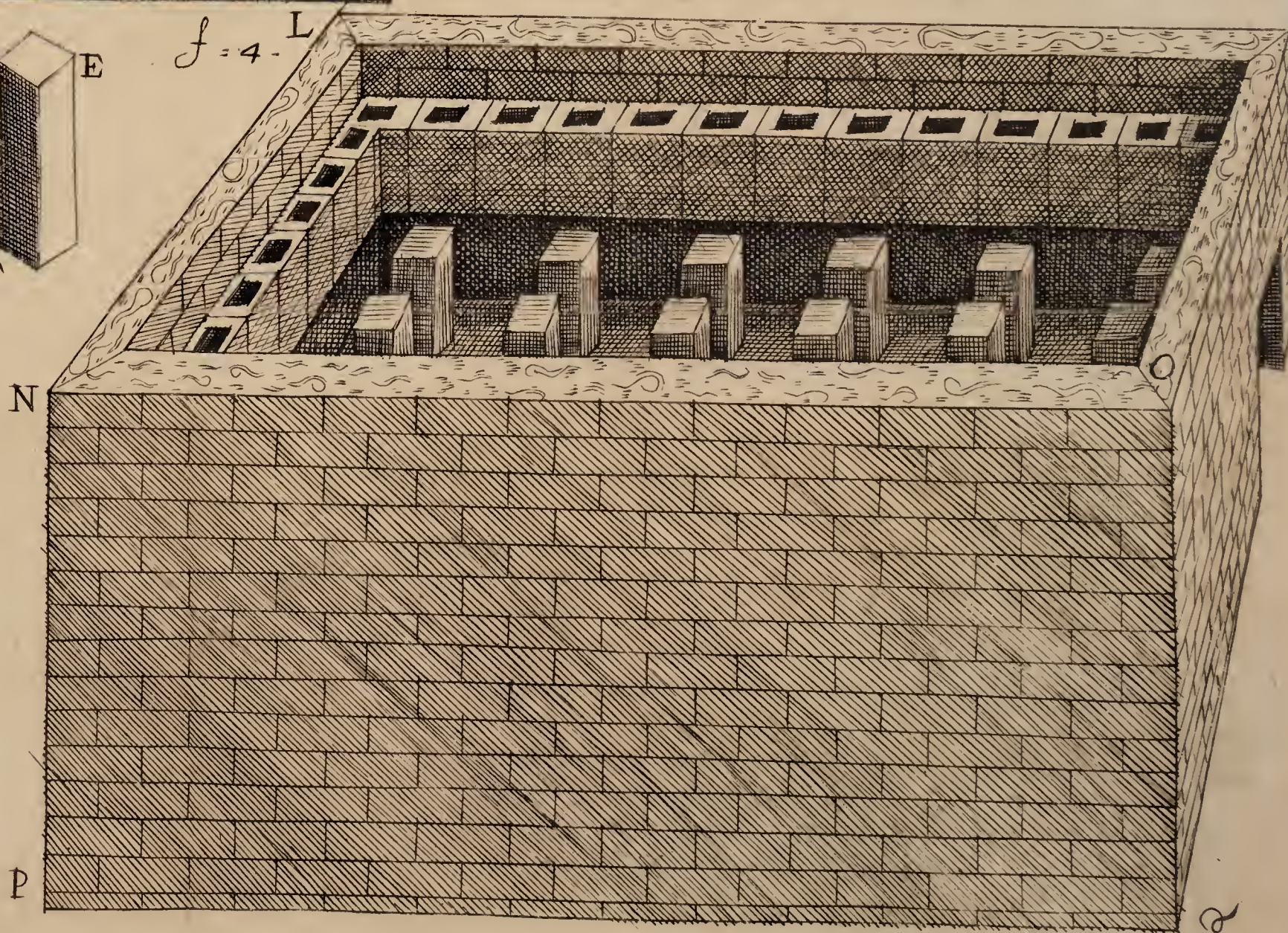
Fig. 6.



$f = 2 -$



$f = 4 -$



1 2 3 4 5 6 7 8 9 10 11 12 13 14

feet







*opus*, vel *ædificium*: quod equidem conjecerim ex Arcuum vestigiis Romanum fuisse Balneum. Antiqua durat inter plebem fama, hanc Urbem fuisse, immis de *Veroconio* monte Passeribus, à Danis incensam; quod quid sit alii forsan meliùs dicent. Certè vel ferreum sigillum ibi erutum, cui *Reguli* cujusdam Christiani caput Romano Diademate cinctum, & promissà comâ, sub hâc Inscriptione *Caput servi Dei*, satis indicio est, eam non fuisse à Saxo-nibus deletam. Hujus Sigilli Ectypon aliquot retro annis perquam humaniter mecum communicavit modò Reverendus *Veroconiensis* Ecclesiæ Presbyter, *Thomas Markham*. Imò & crediderim vel ex *Ravennatis Itinerario* eam ad ejus tempora, hoc est penè ad Octavum Sæculum, adeòque aliquanto diutiùs, floruisse, & caput fuisse *Cornavorum*, forsan etiam Regia Merciorum Sedes. De tantæ urbis rudibus, melioribus, uti quidem speramus, auspiciis caput suum extulit *Veroconium novum*, non ita longe à vetere positum, de Alneto Britannis, ut vulgo fertur, dictum *Pen Güern*; cum nobis ex Auctoritate vetustissimi cujusdam Bardi *Pen Güern Powys* sit in *Venedotis* in Agro Montegomerico. Saxonibus appellatur *Scrobesbyrig*, quod est *Civitas in dumis*. Britannis etiam hodie eodem plane intellectu *Amwithic*. Siquidem *Wydh*, five *Gwydh*, vel, ut in Legibus Regis Howel scriptum legimus, *With* Britannis dicitur *Sylva*, additâque Præpositione *am*, quod illis, ut & Latinis circum est, *Amwyth* dicentur humiliora fruticeta, Saxonibus *Scrobes*, & vernaculâ Dialecto *Sbrubs*. De *Amwith* etiam Adjectivum effingitur *Amwithic*, five *Dumosa*. Normanni tandem, complanato agresti sono, de *Scrobesberie* fecêre *Slopesberie*, de quo Latinizantium *Salopia*, ut & *Salisberie* de *Sarisberie*. Hæc equidem eo libentiùs commemoro, quo antiquæ Patriæ meæ memoriam redderem illustriorem. Siquidem in hâc Urbe duobus retro sæculis Majores mei Duumviratu, summo ejus loci honore, functi sunt, posterique eorum civitate gaudent perpetuâ; quod de Romano antiqui *Veroconii* jure tractum existimo.

XVII. The Ancients had two sorts of *Hypocausta*; the one called by *Cicero*, *Vaporarium*, and by others *Laconicum*, or *Sudatio*, which was a large Sweating Bath: In which were *Tria vasaria abena*, called *Caldarium*, *Tepidarium*, and *Frigidarium*, from the Water contained in them. The other sort of *Hypocaustum* is not so distinctly handled by Antiquaries, and it was a sort of a *Fornax*, or Kill to heat their Winter Parlours, *Cœnatiuncula Hybernæ*. *Erat & Dieta*, five *Cœnatiuncula* (saith *Argol* upon *Panvinus*) *sub quâ ignis accendebatur: Unde & Cœnatio Hypocaustum*. *Cœnationes Æstivæ & Hybernæ* are mentioned by *Cicero* in *Epistolis*. The Terrace Floor is called by *Vitruvius*, *Testudo*. *Testudines Alveorum* in *Communi Hypocausti calefacientur*, saith the same Author. This *Hypocaustis* was called *Alveus* and *Fornax*: And the Man that tended the Fire *Fornacator*. The *Tubuli* seems to have been contrived to conyey away the smother, that otherwise would choke the *Fornacator*: This kind of Stove seems to be graphically described by *P. Statius* in *Balneo Hetrusci*. Of the Terrace *Argol* has these Words: *Testudines sunt pavimenta sub quibus Fornax ardet*. By the way, I take the word Stove to be

*Of the Hypocausta of the Ancients, by the same. ib. p. 2132.*



be deriv'd from *Æstus quasi Æstuvium*, [there wants hitherto a proper *Ety-mon*.

*Ancient Brass Instruments in Yorkshire, by Mr. Thoresby n. 322. p. 393.*

Plate 7. Fig. 7.

\* Hist. Gr. Brit. ch. 6.

*Remarks by Mr. Thomas Hearne to Mr. Thoresby. ib. p. 395.*

XVIII. 1. As the Servants of Mr. *Ellis* of *Kiddel*, were Plowing in a Place called *Osmond-thick*, near the noted *Bramham-Moor*, they discovered five or six Brass Instruments, which are of different sizes, from little more than 3 to 4 Inches and an half in length, and from 1 and a half to 2 Inches and an half in breadth: They are somewhat in the form of a Wedge, as proceeding from a thin Edge, which after so many Ages is tolerably sharp, to 1 and an half or 2 Inches at the thicker end, where they are wrought hollow to put upon a Shaft: Each of them has an Ear or Loop as in the Figure. Some suppose them to have been *Arrows-Heads* or *Axes* of the ancient *Britains*; others, those of the *Roman Catapultæ*; but I think they are as much too heavy for the first, as they are too light for the last. I should rather take them to have been the *Heads* of *Spears*, or *Walking-staves* of the civilized *Britains*; and tho' of a somewhat different Form from those described by \* *Speed* in their Portraitures, taken I presume from ancient Manuscripts, yet by the Loop in the side we may better conceive how those ornamental Labels were fastened, than by the Pictures there exemplified. *Swords* or *Daggers* have been found in *Ireland* and *Great Britain* of late Years; one of which was brought me from the former: It proves of a middle size, viz. eighteen Inches long in the Blade; whereas of those found in *Wales*, some were but twelve, others twenty four. The Hilt or Handle probably was of Wood, (as is that of an old Sword that I have now by me, which is five Foot and an half long) for that it is wholly consumed: They have been fastened together by four larger or two less Nails, as appears by the Holes in the Brasses which are yet entire. I have an ancient Spur, that is no less than six Inches and an half long from the Heel to the middle of the Rowel; but this, which is gilded, and of nicer Workmanship, I suppose to be of a much later date.

2. These *Instruments* it appears from your *Letter* are of *Brass*, and are five or six in number, but of different Sizes, from a little more than three to four Inches, and an half in length, and from one and an half to two and an half in breadth. They are somewhat in form of a *Wedge*, as proceeding from a thin Edge to one and an half or two Inches at the thicker end, where they are hollowed to put upon a Shaft. From your exact and nice Relation, 'tis plain that they are just like that we have in the *Repository* adjoining to the *Bodl yan Library* at *Oxford*. This has been kept there for several Years; but where 'twas discover'd, there is not the least *Memorial* to inform us: Perhaps it might be procur'd by Dr. *Plot*, when he was writing the *Natural History* of *Staffordshire*, where he has<sup>a</sup> mentioned several *Instruments* of the same kind dug up in that County. You have told me that 'tis your Opinion that these *Instruments* were the *Heads* of *Spears* or *walking Staves* of the civilized *Britains*; and for Confirmation of it you refer me to Mr. *Speed's* His-

<sup>a</sup> See Chap. X. §. 19. &c.



*tory of Great Britain*,<sup>b</sup> where he has publish'd the *Figures* of the *ancient Britains* both before and after they were *civiliz'd*. You acknowledge however that the *Tops* of the *Spears* there are *somewhat* different from those we are now considering. And indeed they are not only *somewhat* but *altogether* different, being exactly of the same *Make* with those we find in the *Columna Trajana*, and the *Books* that represent to us the *Military Instruments* of the *old Romans, Greeks, &c.* But had they been of some *Resemblance*, yet I cannot see that those *Figures* in *Speed* are of any *Authority*: For tho' you guess that they were copied from *old MSS.* yet I could never yet meet with any *MSS.* of our *British History* that have any such *Figures*. If ever any one had them, we have reason to presume that other *Books* upon the same *Subject* would have retain'd them; at least we ought not to doubt it of *Copies* of the same *Author*. That is the *Method* observ'd in other sorts of *MSS.* The *Illuminators* were generally left at liberty as to the *Ornamental Parts* of the *Great Letters*; but when any *Figures* were to be *depicted* that should illustrate and explain the *Author*, there they were to be *exact* and *punctual*, and they had no more Allowance to *alter* them, than they had to *alter* and *interpolate* the *Text* of the *Author* himself. Hence I am inclin'd to think that these *Figures* are *modern*, and are owing to Mr. *Speed* himself. 'Tis also what himself insinuates in the same *Chapter*, acknowledging that they were adapted to the *Descriptions* given of the *Britains* in *ancient Authentick Authors*. But not to examine other *Particulars*, the *Form* of the *Spears* in their *Hands* is not countenanc'd by any *Authority* of Note. For tho' *Herodian* has acquainted us that they used *short Spears*, yet he is silent as to the *Make* of them. Nor indeed have we any where a good Account of the *Military Arms* of the *Britains*. The *Authors* transmitted to *Posterity* by them are modern in comparison of the *Roman Writers*, and are withal *Romantick* and not to be rely'd on. And as for the *Bards* they took no care to transmit to *Posterity* these *Weapons*, or to give us *nice Relations* of their *Countrymen*. 'Tis true, there have been and are still found several *Instruments* made of *Flint*, which the best *Judges* esteem to be *British*. The *Flint Heads* of their *Arrows* are commonly called in *Scotland* *Elf-Arrows*, as being supposed to have an *extraordinary Virtue* against the *Elves*, and to drop from the *Clouds*. There are other *Flints* somewhat in form of *Axes*, and these Dr. *Plot* calls<sup>c</sup> *British Axes*; but Dr. *Leigh* thinks<sup>d</sup> they are *Indian*. Sir *William Dugdale* inclines to the Opinion embrac'd by Dr. *Plot*, and he acquaints<sup>e</sup> us with several of about four *Inches* and an half in *length*, curiously wrought by *Grinding*. But they might as well have been *Roman*, the *Romans* having used *Flint Weapons* as well as the *Britains*, and 'twas from the *Romans* that the *Britains* learn'd the *Art* of *working* them. That which also seems to make us believe that they might be *Roman*, is that those mentioned by Sir *William* were found at *Oldbury, Aldbury* or *Ealdbury*, which was a *Roman Fort*, and is the same in Signification with *Alcester* in *Oxfordshire*, *Alcester*

<sup>b</sup> Lib. I. c. 7. <sup>c</sup> Loco supra citat. <sup>d</sup> *Natural History of Lancashire*, lib. I. p. 181.

<sup>e</sup> *Antiquities of Warwickshire*, pag. 778.



being nothing else but *Eald-cearzen*, so call'd by the Saxons to shew that 'twas a Place of *Antiquity* even in their *Time*. And tho' the *Anonymous Author* of the *Antiquities* of *Alcester* at the end of the *Parochial Antiquities* of *Am-brosden* derives it from *Allectus*, as if he were the *Founder*, yet there is no *Authority* either from *Coins*, *Inscriptions*, or *Books* to countenance the *Con-jecture*.

Now since there are no *Authentick Authors* by which we may learn what *Arms* were made use of by the *Britains* in their *Wars*, I can think of no properer *Method* for finding this out than by seeing what *Arms* were in use amongst those *People* from whom they immediately had their *Original*. Mr. *Sheringham* inclines to the *Story* of *Geoffry of Monmouth*, who deduces the *Britains* from the *Trojans*. And this is the *Opinion* too of several other *learned Men*. But whatever their *Abilities* and *Authority* might be in other *Respects*, yet in this they must be reckon'd *partial*, and I rather strike in with those other *Writers* of more *Authority*, who derive the *Britains* from the *Gauls*; amongst whom Mr. *Camden* is *chief*. He has *diligently* and *nicely* prov'd that the *Gauls* and *Britains* had the same *Religion*; that they both had their *Bards* and *Druids*, enjoy'd the same *form* of *Government*, us'd the same *Method* of *Fighting*, had the same *Natural Genius*, were equally *candid* and *innocent*, were addicted to *change* when provok'd, were *compassionate* to their *Relations*, and always ready to partake in their *Vindication*. He has withal shewed that they both affected great *Numbers* of *Servants*, that their *Buildings* were alike, and were surrounded with *Woods*, that they both usually wore *Chains* of *Gold* about their *Necks*, and had *Rings* on their *Middle-Fingers*; that they both wore long *Hair*, and that the *Garments* call'd *Brachæ* were common to each. These Things he confirms from the *best* and *most approved Authors*. And, as the *chiefest Argument*, he has alledg'd *Variety* of *Instances* to shew that they spoke the same *Language*. Mr. *Sheringham* himself was aware of this, and therefore to evade the *Force* of the *Argument* he makes<sup>f</sup> the *Trojans* to come through *Gaul*, which being then thinly inhabited, he says *Brute* and his *Companions* soon conquer'd it, built a *City*, and continued there 'till such time as they had well peopled it, after which they pass'd over into *Britain*, and by that means the *Britains* came to have the same *Language*. This is his *Hypothesis*, which is so far from deserving *Approbation*, that it does not seem consistent with usual *Prudence*, nor with the other *wise Acts* that are ascrib'd to *Brute*: For no one that *rightly* considers can think that *Brute* would voluntarily leave so large a *Country* as *Gaul* for one that was so much *less*. It is therefore more likely that the *Britains* had their *immediate Original* from the *Gauls*. *Cæsar* himself thought so as to those that inhabited more near the *Coasts*, notwithstanding his *Observation* that the *Midland People* were *Aborigines*. Nor will *Boxhorn's Assertion*, that the *Gallick Tongue* was the same with the *Scythian*, overthrow this *Hypothesis*: For it may very well be supposed that the *Gauls* came first from the *Scythi-*

<sup>f</sup> See his Book de Origine Gentis Anglor. pag. 7. & seqq.



ans, who are in *Justin* & observ'd to have been the most ancient People, and to have contended with the *Ægyptians* on that Score. This will exactly agree with what *Cambden* and others have asserted concerning the *Gauls* being descended from *Gomer*, the eldest Son of *Japhet*. I know indeed that *Mr. Sammes* derives the *Scythians* from *Magog* the second Son of *Japhet*. But (not here to take notice of his contradicting himself in this Point) since *Strabo*<sup>h</sup> and *Stephanus*<sup>i</sup> mention a City call'd *Gogarena* between *Colchis* and *Iberia*, and since the city *Hierapolis* in *Cælo-Syria*, according to *Pliny*<sup>k</sup>, was call'd by the *Syrians* *MAGOG*, 'tis more probable that *Magog* seated himself in those Countries, near to which 'tis agreed his Brethren settled; than that he wandered so far out of the Way from them. Here I cannot but take notice that the *Britains* were like the *Scythians* a frugal People, and their long Lives (they often living to the Age of 120 Years) might in great measure be ascrib'd to their Temperance, and their Milk Diet, just like the *Hippomolgs* mentioned by *Homer*<sup>l</sup>. And as *Æschylus* tells us that the *Scythians* were ἱππικὴς βοτῆγες σύνομοι, a just Nation and addicted to the Feeding of Horses, so the same may be said of our ancient *Britains*, who were very religious and observ'd the Rules of their Priests, and took extraordinary delight in Cattle, whence perhaps they might affect to have the figures of Beasts cut upon their Bodies. From what has been laid down I hope 'tis plain that the *Gauls* and *Britains* were of the same Original. What we have next to do is to see what Arms were us'd by the *Gauls*. There are several Authors that have written of the Nature of them, and particularly *Cluver* and *Boxhorn*. Their Names are *Spatha*, *gessum*, (*gesum* or *gæsum*) *lancea*, *sparum*, *cateia*, *mataris* or rather *materis* (not *matara*) *machæra*, μέγας, μάγας, μάγας or μάγας<sup>m</sup> *thyreos*, and *cetrum* or *cetra*. I shall not here insist upon the Signification or Reason of the Names, but only observe in general, that the *gessum* was a Javelin, the *sparum*, *cateia* and *mataris* were different sorts of Darts, and that the *thyreos* was an oblong and the *cetrum* a short sort of Shield. So that the *Spatha* only remains (for the nature of the Lance is well known) to be compar'd with the Weapons we are considering. 'Tis call'd by the *Italians* *SPADA*, and by the *Spaniards* *ESPAÑA*. From the Description that *Isidore* has left us of it, we are inform'd that 'twas a two-edg'd Sword, with which they cut and did not thrust. Whence 'tis plain these Arms had not sharp Tops, agreeable to what *Livy*<sup>n</sup> has related that their *gladij* were *prælongi*, *ac sine mucronibus*. And *Polybius* has the same reason why they did not push with them. Hence it is clear that our Instruments which have not two Edges, but are dull like Wedges were not *spathæ*; and since they do not agree to any of the other Gallick Instruments, we must carry on our Inquiry, and examine whether they agree with any of the Arms of some other ancient Nation that made a Figure in Britain.

Our Ancestors the Saxons will have no share in this Inquiry: For 'tis plain from the History of them given by *Verstegan*, and the figures publish'd by

<sup>g</sup> Hist. Lib. II. c. 1. <sup>h</sup> Lib. II. <sup>i</sup> De Urbib. voc. Γωγαρήνη. <sup>k</sup> Nat. Hist. Lib. V. c. 23. <sup>l</sup> Il. XIII. v. 3. <sup>m</sup> See *Livy* Lib. VIII. c. 24. Edit. Oxon. <sup>n</sup> Lib. XXII. c. 46. Edit. Oxon.



• Pag. 354.

him, that *Spears, Halberds, Shields, Cross-bows, Swords*, (which were broad and bowing, somewhat in fashion of a *Scythe*;) and *Hatchets*, which they call'd *Bills*, were the *Arms* made use of by them; nor did the *Weapons* of the *Danes* that succeeded them much vary if at all: Coming from the same *Parts* they us'd the same *Customs* in their *Military Undertakings*. For tho' the *Normans* endeavour'd to make an *intire Alteration*, yet they found the *Attempt* impracticable, and they were forc'd to acquiesce, and lay aside their *Proposals*, which thwarted so very much those *ancient Customs* that were here generally entertain'd and receiv'd. But however, notwithstanding these *Instruments* do not resemble either the *Saxon* or *Danish Military Arms*, yet I find in *Wormius's Museum* ° two *Cimbric Instruments* with which they have some *likeness*. These he tells us were of *Brass*, and he calls them *Wedges*: The larger of them was five *Inches* in *length*, and three in *breadth*. He is of opinion that they were us'd in the *Wars*, especially when the *Armies* were very near each other. If they had *Holes* by which they might have been fix'd to *Helves* he would have believ'd them to be *Battle-Axes*; but being neither *hollow* (as ours are) nor having any other way of being fasten'd to other *Instruments*, he concluded that the Name of *Wedges* might be most proper. A very ingenious Gentleman some time since inform'd me that much such *Instruments* had been found in the *Isle of Man*; and that a great many *Urns* had been also discover'd there, as likewise divers *Inscriptions* with *strange Characters*. I do not question but the *Inscriptions* are *Runick*. And 'tis highly probable that the *Instruments* were like those in *Wormius*; but if they agree exactly with ours they will from what I shall say by and by appear to be *Roman*. For notwithstanding it be commonly held that the *Romans* never were in this *Isle*, yet I see no other reason why it should be thought so, than that the *ancient Authors* now remaining do not mention it. This is only a *negative Argument*, and what we ought not to lay a very great *Stress* upon. The *Urns* seem clearly to evince that they were here. I know indeed that 'tis said that these *Urns* must be perfectly *Danish*, by reason of the *small black Bones* and *Ashes* found in them; which however is no *sure Ground* to go upon. For I have seen in the *Bodleian Repository* a Piece of a *Roman Urn*, which was dug up several *Years* ago at an *old Roman Town* in *England* with many others, some of which were of different *Figures*. 'Tis now in a *Box*, and with it are little *black Bones, Ashes, &c.* wrapped up in two *Pieces* of *coarse Linen*. This *Linen* is in the same figure with the *Urn*, but the *Urn* for one of the *Pieces* is wanting. The *Smallness* of the *Bones* shews that they are the *Relicks* of *Children*. It was customary among the *Romans* after the *Bodies* were burnt to wash the *Bones* with *Wine* and *Milk*, and afterwards the *Women* wrapt their *Children* in *Linen*, dry'd them in their *Bosoms*, and then put them into *Urns* to be buried. This *Custom* was also peculiar to the *Danes*, who learn'd it from the *Romans*, from whom likewise they receiv'd *Urn Burial* it self. Such *Urns* too are mentioned by the famous *Sir Thomas Brown* to have been found at *Old Walsingham* in *Yorkshire*. Nor is the *Roman History* altogether silent of the *Isle of Man's* being known to the *Romans*. For *Plutarch* expressly tells us, that



that one *Demetrius* sailed hither, as well as to other *British Isles* in the Reign of *Adrian*. 'Tis no wonder that *Runick Inscriptions* are discovered in the *Places* where *Roman Urns* are found. Those *Inscriptions* might have been made upon other *occasions* after it became in *future Ages* inhabited by *Danes* and *Norwegians*. The same *Accident* has sometimes happen'd in *England*. And Mr. *Camden* particularly relates in the Close of his *Discourse* concerning *Stone-Henge*, that in the Time of King *Hen. VIIIth.* was found at *Stone-Henge* a *Table* of *mixt Metal* on which were engrav'd many *Letters*, but the *Characters* were so *strange* that neither Sir *Thomas Elyot*, nor Mr. *Lilly*, the famous *School-Master* of *St. Paul's*, could tell what to make of them, and so there was no care taken to preserve the *Monument*, the *Loss* of which was afterwards much lamented by *Olaus Wormius*, who thought it to be *Runick*, as without question it was: and yet *Stone-Henge* itself is a *Roman Work*, as has been made out by Mr. *Inigo Jones*, who tho' he was confuted by the late learned Dr. *Charleton*, yet Mr. *Jones's* Opinion was very well defended by Mr. *John Webb*, who has in his *Book* distinctly examined the *Methods* made use of both by the *Romans* and the *Danes* in their *Buildings*.

Having proceeded thus far in this *Inquiry*, and shew'd that these *Instruments* were not *military Arms* either of the *Britains*, or of the *Saxons*, or of the *Danes*: I shall now carry it on farther and endeavour to prove that they are owing to the *Romans*, which is what I have before insinuated. I once thought that they were a sort of *Axes* which the *Romans* made use of in their *Sacrifices*, of which Dr. *Plot* takes notice of two sorts, the *secures Lapideæ* and the *secures Cupreæ*, tho' Dr. *Leigh* will have his *Instances* to be both *Indian*. Upon a more narrow consideration of the *Roman* sacrificing *Instruments*, I have quite chang'd this *Opinion*, not finding the least *Foot steps* of such *Axes* in any of the *Books* of *Roman Antiquities* I have hitherto consulted. On the contrary, they are in the *Suovetaurilia* or *Solitaurilia* of the *Columna Trajana* represented in the same *Form*, and fastened in the same manner, that we use at this *Day*. And so also in other *Sacrifices*, as may partly be seen in the *Gemms*, *Rings*, &c. publish'd out of the *Studies* of *Augustinus*, and *Görlaus*, as well as in the *Monuments* of *Gruter*, *Reinesius*, *Spon* and *Fabretti*, to omit the *Authors* collected upon this *Subject* by *Grævius* in his large *Body* of *Roman Antiquities*. Neither could they have been the *Heads* of *Spears*, as is manifest from the same *Authorities*. The *Roman Spears* and *Javelins* occur very frequently, and yet not one of them either on their *Coyns* or elsewhere is to be met with in the *Figure* of these *Instruments*. 'Tis true some of their *Spears* had two *Heads*, so they might use either *End* uppermost as they pleas'd. We have one of these in *Augustinus*<sup>1</sup>. The *Heads* differ from one another, but they neither of them answer our *Monuments*. Nor are the most antient *Spears* of the *Romans* we meet with different from those they made use of in more *modern Times*, as may in some measure be seen in the famous *Shield* lately published at *Oxford*<sup>2</sup>, which is certainly au-

<sup>1</sup> Gemm. & Sculpt. antiq. ex Edit. Jac. Gronovii Franeq. 1694. Part. num. 155. <sup>2</sup> Vide Livij Edit. Oxon. Vol. VI. p. 195.



*thentick*. It's *Antiquity* is defended in the *Place* I have cited. It may here be farther added to what is there alledg'd that *Lucius Florus* gives <sup>s</sup> us the first *Instance* of the *Romans* fighting upon *Horses* without *Bridles*; and in the *Columna Trajana* <sup>t</sup> the *Horses* are placed in full speed with their *Riders* without any *Bridles* or other *Curbs* to restrain and guide them, a great many of the *Romans* having made themselves *Masters* of this method of *Fighting* that they might like the *Numidians* (who were famous for it) be the less incumber'd in the *Battle*, and rush upon the *Enemy* with the more *Force*. Their *Desultores* also are *Proof* enough of it's being practicable.

But now tho' these *Instruments* are not properly *Roman military Weapons*, such as they us'd in their *Battles*, yet they were of service amongst the *Soldiers*; and good Numbers of them were constantly provided to be carried about in the *Army*. For I believe that they are *Roman Chissels*, and that they are us'd to cut the *Stones*, and other *Materials* that were judg'd serviceable for building their *Camps*. This is not *Conjecture* only as appears from the *Columna Trajana*, where <sup>u</sup> the *Soldiers* are represented polishing the *Stones* for the *Roman Tents* in the *Dacic Wars* with such sort of *Chissells* made of *Brass*. These *Chissells* they beat and worked into the *Stone* and other *Materials* with *Mallets* of the same *Metal*. We have other *Instances* of it in the same *Pillar*, which is one of the best *Monuments* we have by which to judge of the several *Instruments* made use of by them in their *military Enterprises*. These *Chissells* were of admirable service in making their *Aggeres*, which consisted of *Earth*, *Stones* and *Timber*. The *Stones* were sometimes thrown together without any *polishing*; but that was more rarely, and 'twas look'd upon as a better *security* to have them work'd that they might lye even. By this Account the reason will be easily perceiv'd why these *Instruments* are hollow, namely to fasten *Handles* to them for more convenience in driving them. If they had been *Wedges*, 'twould have been a great *Inconvenience* to have had them hollow. Besides the *Wedges* by being drove into the *Wood* or *Stones* would have been strangely worn on the *Sides*, and have receiv'd considerable *Alterations*; whereas the *Sides* of ours in the *Bodleian Repository* (and I suppose your's are so too) are just as they were at first, and there is not the least *Change*, unless it be on the *Edge*, which is very blunt and much broken, which I guess to have proceeded from the *Stone*. As for the *Ears* or *Loops*, 'tis probable they might be put on that thereby the *Handles* might be fixt the better; or perhaps they were design'd for the Ease of the *Souldiers*, who in their *Journeys* might by this means fasten them to their *Girdles*. For I believe most if not all the *Soldiers* had such *Instruments*, which they were oblig'd to make use of when *Necessity* requir'd. I know that 'tis the opinion of most that there were a few particular *Persons* always in the *Army* to whom these *Works* were committed, and that they were exempt from the Office of *Soldiers*, and that they were *marmorarii*, *quadratarii*, *lignarii* and *structores*. These may be call'd all by one Name

<sup>s</sup> Lib. I. c. 9. <sup>t</sup> Num. 199. <sup>u</sup> In Num. 167.



*fabri murarii*, tho' that is commonly reckon'd only another Name for *structores*. But this is a wrong *Persuasion*, and *Fabretti* has<sup>w</sup> well observ'd that there are no *fabri murarii*, as they are taken for *Artists* distinct from *Soldiers*, on *Trajan's Pillar*. This *Observation* he has made in opposition to *Santi Bartoli*, who calls them expressly *fabri murarii*. *Fabretti's Remark* as 'tis very just with respect to this sort of *Artists*, so it must be noted that there were no other distinct *Artists* that were freed from the *Duties* of *Soldiers*. Even the *Artists* that had receiv'd liberal Education are to be comprehended in this *Observation*, I mean their *Physicians*: which is the reason that in *Fabretti* we have<sup>x</sup> the *Picture* of a *Physician* fortified with a *lorica* or *Coat of Mail* and moving his *Hands* to a *sick Person* that was his *Patient*. The *lorica* shews he was one of the better sort of *Soldiers* call'd *evocati*, those of the *inferiour Order* being allow'd only a *Pectoral* of thin *Brass*. It withal points out to us that he was, after he had finish'd these *Offices* to the *Sick*, bound to betake himself to other *Offices* of a *Soldier*. This was sometimes intermitted, but in *Trajan's* strict *Discipline* 'twas always observ'd, he being resolv'd to imitate and bring into *fashion* the *Severity* that had been made use of in the more *antient Times*. For this reason we see the *Soldiers* in this *Pillar* duly exercising and performing, when there was any *need*, all the *Offices* of *Tradesmen*, it being at this time *customary* to list *Tradesmen* amongst the *Soldiers* for this *Intent*.

Besides the *Uses* these *Instruments* were put to in forming the *Roman Camps*, they were moreover employ'd in making and repairing the *High Ways*, which swallow'd up a large *Quantity* of *Stone*, especially in such *Places* as were *marshy* and *fenny*. The *Pomptin Marshes* were vastly large, and yet at such time as the *Soldiers* were too many to be us'd against the *Enemy*, a *motion* was made that they should be employ'd to *drain* them, which was so well approv'd, that the *Senate* immediately gave *Orders* for it, and the *Soil* was so *rich* and *fertile* that great *Numbers* came and settled here, insomuch that there were no less than XXXIII. *Towns* built upon the *Ground*. The *Waters* however afterwards got strength again, and 'twas in a manner wholly drown'd; which made *Julius Cæsar* entertain some *Thoughts* of *draining* them *afresh* and of carrying the *Appian Way* through them, whereas it had before went about them; but he fail'd in his *Design*, and 'twas left for one of his *Glorious Successors* the *Emperor Trajan*, who after he had cleans'd the *Fens*, caus'd a *Stone Way* to be made through them, whereon were built large *Inns* and magnificent *Bridges* for *Conveyance* of the *Water* which was in the upper part of the *Marsh*. For memory of which he had a *Monumental Stone* erected with a proper *Inscription*, by which it appears that the *Way* was XIX *Miles* in *length*, there being plac'd at the *End* of every *Mile* a *Mile-Stone*, and from thence the *Way* it self was in succeeding *Times* call'd *Decennovium*. I might from hence take occasion to mention other *Works* of the *Romans* in *Italy* of this kind, in which *Chiffells*

<sup>w</sup> Syntagm. de columna Trajana. pag. 208.    <sup>x</sup> Loco cit. pag. 217.



were *absolutely necessary* for cutting the *Stones*; but this is needless at present, and therefore I shall only remark that as *Trajan* was diligent about the *Ways* in *Italy* and other *Parts*, so it seems he was no less careful of these *Affairs* in *Britain*. For notwithstanding some tell us that the four *Great Ways* in *Britain* are owing to *Molmutius* one of the *British Kings* and *Belinus* his Son, yet Mr. *Camden* and others have shew'd that they are rather to be attributed to the *Romans*, being repair'd and made as it were quite anew (whereas before they were very mean) by *Trajan*, after he had reduc'd the *Britains* to *Obedience*. Besides which *Ways* he also made divers other *Lesser* ones here, and perhaps these *Chissells* that have occasioned this *Letter* may be some of those us'd by the *Souldiers* in his *Reign*; tho' before his *Time* *Acts* of this kind had been perform'd by the *Roman Souldiers*, who also forc'd the *Britains* to undergo the same *Drudgery*, which occasion'd them to complain to *Agri- cola*, as if they were too *severely* and *hardly* dealt with.

If it be ask'd how it comes to pass that these *Instruments* are of *Brass* rather than of any other *Metal*? it may be reply'd that they as well as the *People* of other *Nations* in former times thought there was an *extraordinary* virtue in *Brass*. Whence it was that they us'd *brass Instruments* when the *Moon* was in an *Eclipse*<sup>y</sup>, thinking that by beating of them she would be the more easily recover'd from her *Labour*, which custom almost universally prevail'd. And 'twas upon account of this peculiar *Virtue* suppos'd to be in *Brass*, that the *Instruments* made use of in the *sacred Offices* were in the more early times all of *Brass*, that the *Tuscans* used *Brass Plowshares* when their *Cities* were built, and that the *Priests* of the *Sabins* were shav'd with *Brass Razors*<sup>z</sup>. *Hesiod* himself tells us that the *Antients* us'd *Brass Instruments* before *Iron* ones:

Χαλκῷ δ' ἐρράζοντο μέλας δ' ἐκ ἔσκε σίδηρος.

At which time not only their *Arms* but their *Houses* were likewise of *Brass*.

Τοῖς δ' ἦν χαλκεα μὲν τῶχεα χαλκεοὶ δέτε οἶκοι<sup>b</sup>.

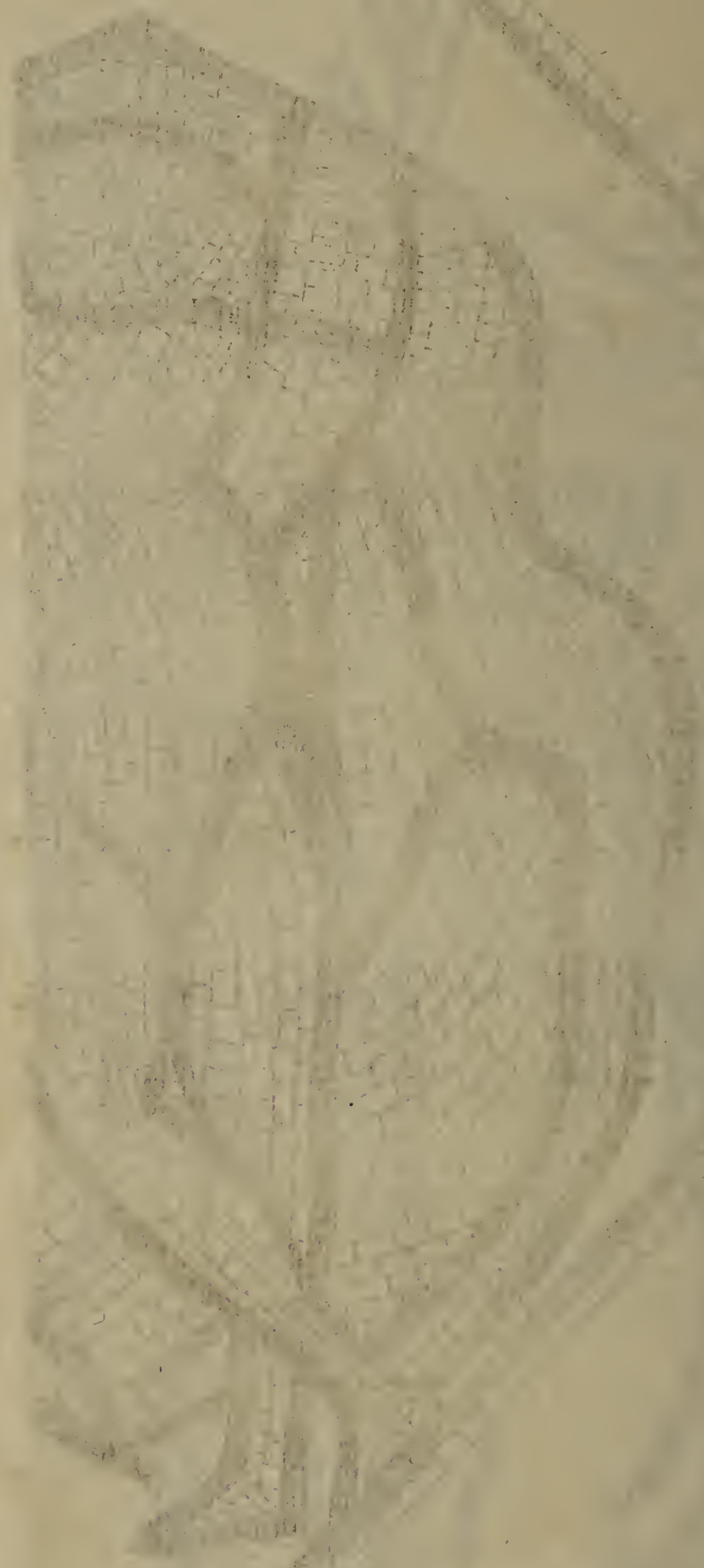
The *Custom* might prevail as well in *Britain* as elsewhere, *Iron* being not so very plentiful in the first time of the *Romans*, however it might increase afterwards when the *Bath-Forge* was erected, and all proper *Methods* us'd upon that occasion. Nor ought it to be wonder'd how the *Brass-Chissells* could be apply'd to the *Stone* without breaking to pieces immediately, any more than that the *Plough-shares* did not suffer the same *Damage* in casting up the *Ground* and grating against the *Stones* with more *Violence*. The *Brass* in those early times was of a different nature from ours, and so temper'd as to endure much longer with less inconvenience in the several *Operations* to which it was employ'd.

<sup>y</sup> See Livy lib. XXVI. c. 5. Edit. Oxon. <sup>z</sup> Vide Rhodigini antiq. Lect. l. XLX. c. 10.  
<sup>a</sup> Egey. & Hm lib. I. v. 150. <sup>b</sup> Ibid. v. 149.











As for another Piece of *Antiquity* which you tell me you have in your *Collection*, namely a *Spur* that is no less than six *Inches* and an half long from the *Heel* to the *Middle* of the *Rowell*, which you take to be of a much later Date than the other *Monuments*, we have one in the *Bodleian Repository* of much the same *length*, of which I have made mention in my *Additions* to Sir *John Spelman's* Life of King *Ælfred*. There have been several others found in *England*, and you have justly guess'd your's to be more *modern* than the other *Instruments*. For these *Spurs* are certainly *Danish*, as appears from *Wormius's Monumenta Danica*<sup>c</sup>, where he has given us the *Figure* of one, <sup>c</sup> *Pag.* 43. and there is an Account of divers others towards the latter <sup>d</sup> End of his *Museum*, <sup>d</sup> *Pag.* 50. one of which is a foot and some odd *Inches* in *length*.

XIX. It was first discovered about 40 Years ago, upon digging of a Cellar near *All-Saints Church* in *Leicester*, at about a Yard and half under the common present Surface of the Earth. What extent the whole Pavement was of is not known; but this Figure, which, by order of the Master of the House, was preserved, is an *Octogon*, surrounded by a Lift, as you see in part represented in the corners of the Picture herewith sent you. With-  
out this, tho' not here represented, is a Twist or Wreath of various Colours; and round that, is a second Lift like the former. These two Lifts, with the Wreath between them, are 6 Inches and a  $\frac{1}{4}$  broad. The downright and transverse Diameters of the *Area* are just a Yard; but the others, leading from corner to corner, are a Yard and two Inches and an half. The Man, from Head to Foot, is two Foot and  $4\frac{1}{2}$  Inches. *Cupid* seems to be two Foot, but his Feet as well as the bottom of the Monster are spoil'd, the *Tessellæ* representing them being gone. You will easily understand, that the whole *Area* of the Figure, which is here left blank, ought to be fill'd up with white *Tessellæ*, in like manner as you see some Intervals of Figures here.

*An Ancient Mosaick Work, by Mr. Carte. n. 331. p. 324. See the Figure. Plate 8. A.*

XX. In *March* 1717 was dug the Meadow in which the greatest part of the Pavement lies, it is near a Mile and half South-East of *Bourne*; contains about four Acres, and is of a triangular Form; the Southern Side is against the Sea; only a few Fishers Cottages, and a small publick House or two being between that and the Sea. On the Northern Side of the Meadow is a High-Way, which leads from *Bourne* to *Pevensey*: the West Side is by a Fence of Posts and Rails separated from a large Corn Field, in Common belonging to the Parish. About the middle of this Fence is a Pavement, distant from High-Water-Mark a Furlong; in former times it might have been somewhat more, because from this Point to the Westward, the Sea is always gaining from the Land. In the Summer 1712, when the Fence was repair'd; the Workman sinking a Hole to fix a Post in, was hinder'd by something solid like a Rock; but casting out the Earth clean, found the Obstacle to be Artificial. Whereupon, one *Purceglove* an ingenious Engineer was sent for, who with his Instruments bored through the Pavement;

*A tessellated Pavement, and other Antiquities in Suffex, with Remarks by Dr. Tabor. n. 351. p. 549.*



ment; and in many places of the Ground about it, which he found to be full of Foundations: but this his Discovery of those Foundations, was only a Confirmation of what the Inhabitants there have always observ'd, as well in Ploughing, as in the Growth of their Corn and Grass: for in the common Corn Field, West to the Meadow, to the distance of near half a Mile, they often raise bits of Foundations with their Ploughs; and in dry Summers, by the different Growth of the Corn, they can plainly perceive all that Tract of Ground to be full of Foundations.

The Pavement was little more than a Foot below the common Surface of the Ground; what lay next it was a small Sea Gravel; the Position of it is very near due East and West (about two Foot of the West end of it reaching into the Corn Field;) its length is seventeen Foot and four Inches; its breadth eleven Foot. At first it seem'd to have been bounded with a thin Brick set on Edge, about an Inch above the *Tesserae*, so exactly strait and even, as if Shot with a Plane; and so well Cemented, as if one entire Brick. But when the outside of the Pavement was broke up, we found, that instead of Bricks set on Edge, as was imagin'd, it was bounded with a Border of Bricks laid flat, and their ends next the *Tesserae* turn'd up. The Thickness of these Bricks was an Inch and a Quarter; the Breadth not under Eleven, and not more than twelve Inches; the length full fifteen Inches; which, before they were turn'd up at their Ends, could not have been less than Seventeen. They were very firm, and not in the least Warp'd or Cast in Burning: when broke, their Substance was fine and well mixt, of as uniform and clean a Red Colour, as a piece of fine *Bole*; except at the ends where turn'd up, they were all over cover'd with a Plaister (the same which *Vitruvius* calls the *Nucleus*, of which more afterwards,) half an Inch thick; so hard, entire, and even, that it seem'd as one Stone, quite round the Pavement. Next within the Bricks, were a List or Border of white *Tesserae*, thirteen Inches broad; within that, a List of brown *Tesserae* (somewhat darker than a Whet-Stone, and somewhat lighter colour'd than the Touch-Stone) four Inches broad; then a List of the White, five Inches broad; next within that, another List of the Brown, four Inches broad: all the rest of the Pavement was set with white *Tesserae*, without any Ornament or Figure; which though not Gay, look'd very Neat and Clean.

When this was first view'd, none of the Curious doubted, but that the Work was Roman; many were of opinion, that it might have been the Floor of a Temple, or a place of Worship. *Pliny* indeed <sup>a</sup> informs us, that these sort of Pavements or *Lithostrota*, began to be in use in *Italy*, in the time of *Sylla*; who caus'd one of them to be made in the Temple of *Fortune* at *Prænestæ*; perhaps the same which not long since was taken notice of by Mr. *Addison* <sup>b</sup>. I was rather inclin'd to suppose, it had been that Apartment belonging to the chief Officer where Justice was administer'd; and the more, because *Pilat's* final Sentence on our Saviour was pronounced from a Throne

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<sup>a</sup> Plin. Sec. Hist. Nat. Lib. XXXVI. Cap. XXV. <sup>b</sup> Remarks on several places in Italy, Pag. 377.



Fig. 1. D

Fig. 4.

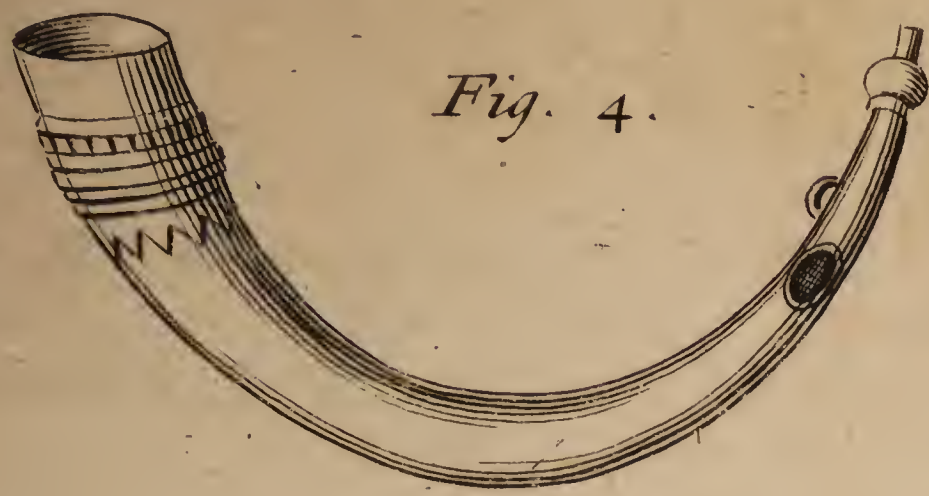


Fig. 5.

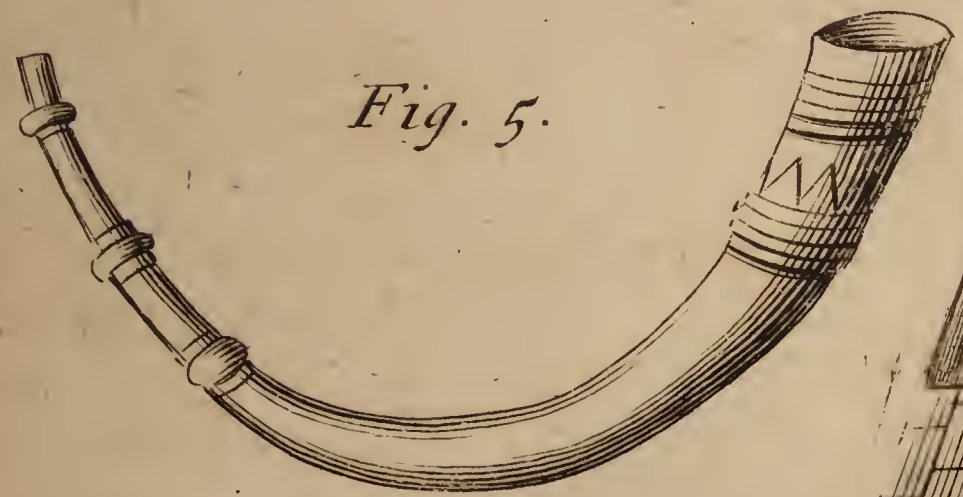


Fig. 6.

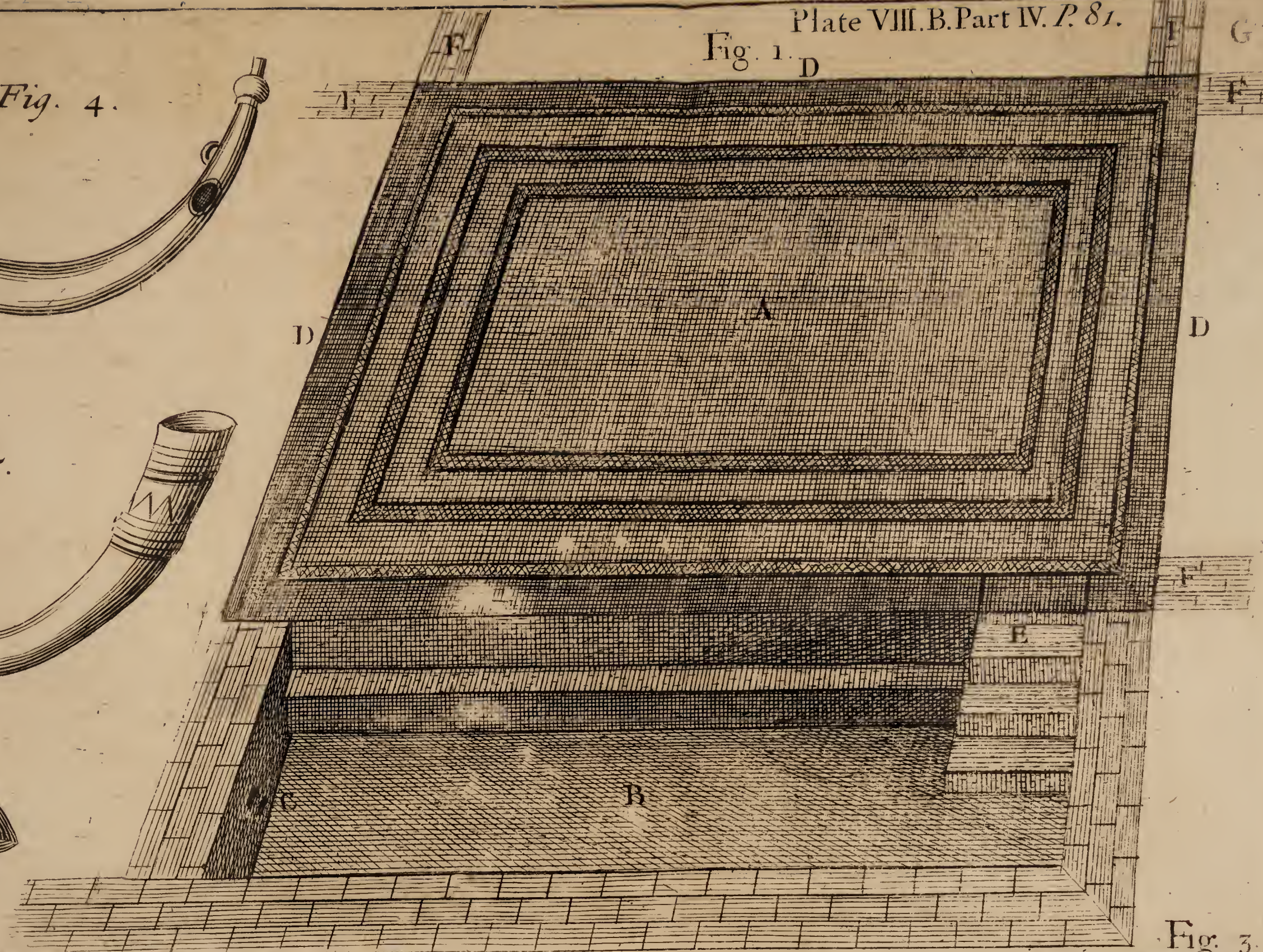


Fig. 3.

Fig. 2.

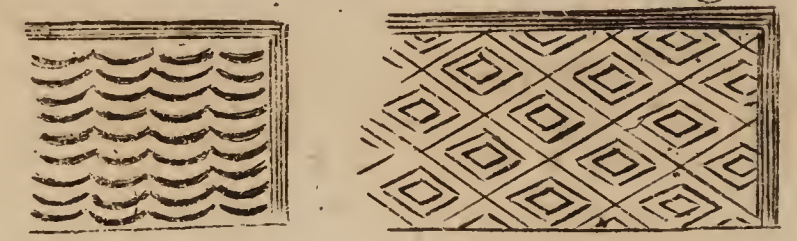


Fig. 7.

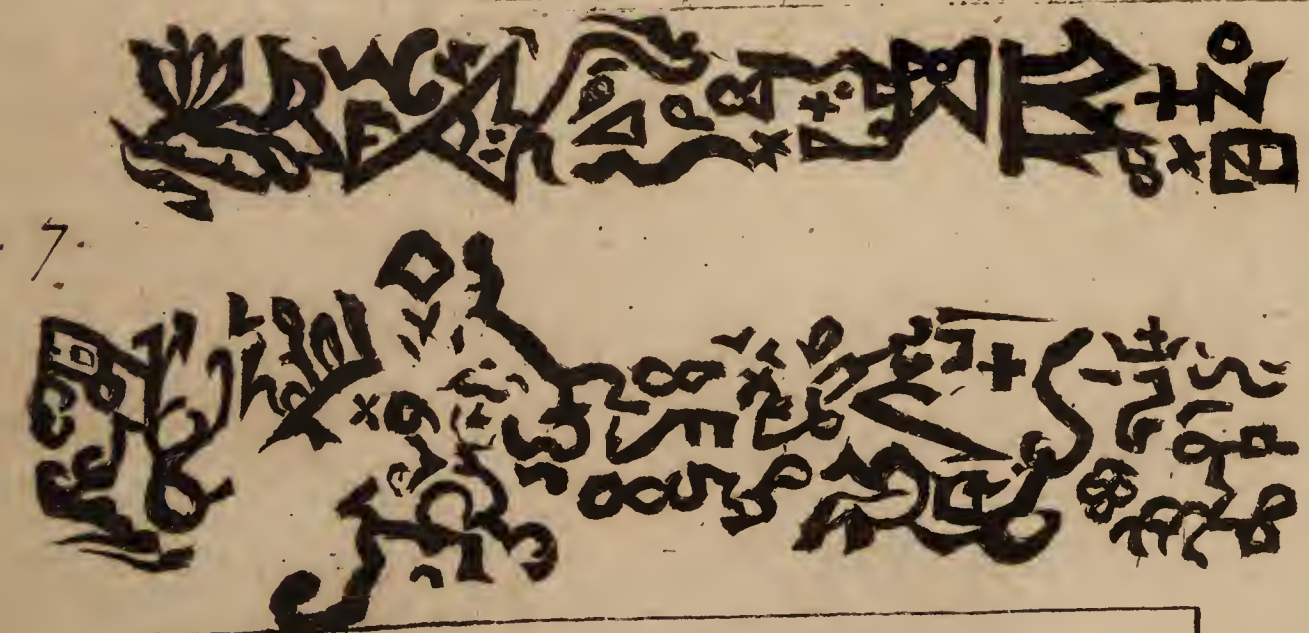
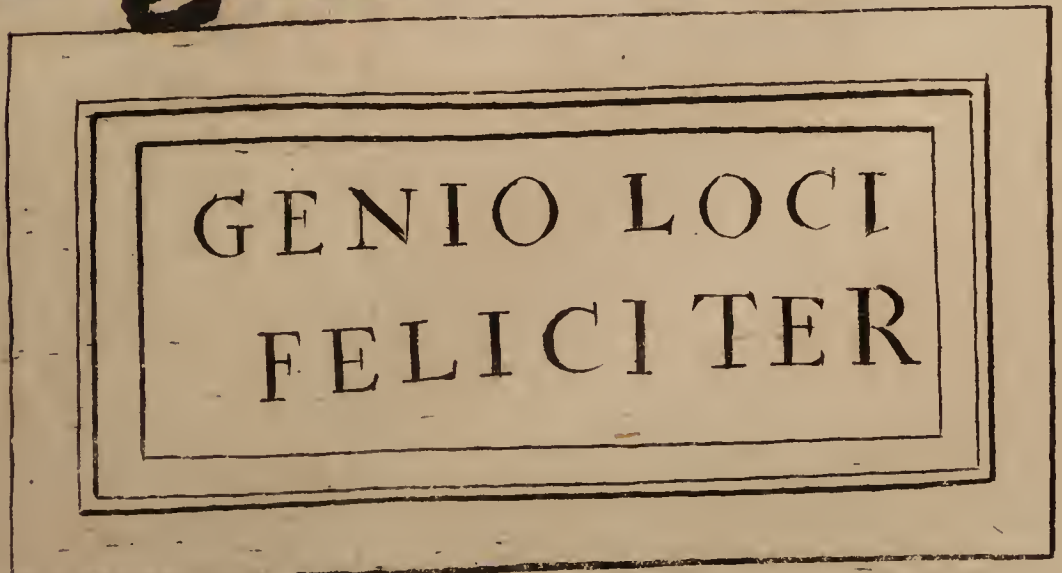


Fig. 8.



A The Pavement. B. The Bath. C. The Sink and the other Passage through the Wall at the East end of the Bath. D. The Roman Brick which bound- ed the Pavement, laid flat and covered with Terrace. F. Foundations continued severall ways. E The Landing place out of the Bath. G. The corner of a large space paved with Roman Brick, and covered with Ashes, Coals. &c.



THE PRINCE OF GEORGES

AND HIS WIFE

THE PRINCE OF GEORGES  
AND HIS WIFE



on the *Lithostroton*<sup>c</sup>; which Appellation was given to these kinds of Pavements by *Varro*<sup>d</sup> not less than sixty Years before; and by *Pliny*<sup>e</sup> not less than forty Years after our Saviour's Suffering. That the Roman Generals caus'd such Pavements to be made at their Stations; we may have just reason to conclude, from that passage<sup>f</sup> in *Suetonius* cited for this purpose by Dr. *Plot*.

When the Ground about the Pavement was dug, all these Suppositions were quash'd; for on the North side of the Pavement, we discover'd an entire Bath, sixteen Foot long, five Foot nine Inches broad; and two Foot nine Inches deep (which the Draught sent with this represents): *Fig. 1. Plate 8.* It was fill'd with Rubbish of Buildings, which seem'd to have been burnt; *sc.* hard Mortar adhering to pieces of Roman Brick, squar'd Stones, and headed Flint, mingled with Ashes and Coals of Wood. From the North-west corner of the Pavement, was the Passage into the Bath, three Foot three Inches wide; at which place, the Bricks that bounded the Pavement were not turn'd up at their ends, but lay even with the *Tesserae*. At the distance of fifteen Inches from the *Tesserae*, there was a Fall of two Inches, to the Landing-place out of the Bath; the Landing-place was also three Foot three Inches long, and two Foot two Inches broad: Thence by two Stairs, was the Descent into the Bath; the length of the Stairs, the same as of the Landing-place; the breadth of each Stair was eleven Inches; the height of each Step a little more than ten Inches; the lowest Stair was twenty Inches from the farthest Side of the Bath. The whole Work was very compact, and exactly well made; not in the least injur'd by time, nor the Violence it underwent when fill'd up; truly answering the Precepts of *Vitruvius*; which<sup>h</sup> advise, that for all Buildings, respect should be had to<sup>h</sup> De Archi- the Strength, Conveniency, and Beauty of the Work design'd; and that<sup>h</sup> De Archi- in order thereto, a careful and judicious Provision should be made of Mate- rials, without Parsimony.

Although the Author and Time of these Works cannot as yet be discover'd; 'tis evident the Artificer near enough follow'd the Directions *Vitruvius*<sup>i</sup> gave for framing such like Structures.

<sup>i</sup> Lib. VII.  
cap. 1.

First, as to the Pavement, it was secur'd on every side, and the Edges of it rested on a very firm and neat built Wall, made of Roman Brick, squar'd Stone and headed Flint; between five and six Foot deep below the Surface of the Pavement, and full twenty three Inches thick; which we may suppose to have been two Foot by the Roman Measure. The Bricks were not in regular course, as they are to be seen in those Roman Buildings, which are in view above Ground; but without order dispers'd about in the Wall. The Top of the Wall indeed was but fifteen Inches thick; and that was cover'd with the Bricks first mention'd, which bounded the Pavement: But about fourteen Inches below the Top, there was a Set-off (as our *Masons* term it) in the Inside of the Wall eight Inches broad. We

<sup>c</sup> *Εὐστρ. ἱστορ.* Ch. XIX. 13. <sup>d</sup> *Ter. Var. de Re Rust.* Lib. 3. <sup>e</sup> *Plin. Hist. Nat.* Lib. XXXVI. Kc. 25. <sup>f</sup> *Jul. Cæs. Sect.* 46. <sup>g</sup> *Oxfordshire Plot's Nat. History*, c. X.



did not dig up the Foundation of the Pavement to the Bottom, but opened it at one Corner only, that we might discover how it was Fram'd; for when it was bor'd through, they observ'd, next under the *Tesseræ*, a Bed of very strong Mortar, more than a Foot thick; under the Mortar a Bed of Clay two Foot thick; and under the Clay a firm Foundation of Brick. We observ'd the Clay (which the Grounds thereabouts do not afford) to be very fine and red, and also close; no doubt but carefully Ramm'd. The Surface of the Clay was neatly pitch'd with small Flint and Stones, Pointed at their lower ends, and Headed at their upper ends. This Pitching or Paving is by *Vitruvius* call'd *Statuminatio*; and the Stones 'tis done with, he calls *Statumina*. He directs them to be set, when the Underwork is made Sound and Firm by well Ramming.

This pitch'd Work was exactly even with the Set-off in the Inside of the Wall; on it was laid a Bed of coarse Mortar of about nine Inches thick; the Skirts of this Mortar (which by *Vitruvius* is call'd the *Rudus*) rested on the Set-off abovemention'd; it was compos'd of Lime, a sharp coarse Sand, small Pebbles, and bits of Brick. Upon this *Rudus* was a finer Composition made, as near as I could guess, with Lime, a fine sharp Sand, some kind of Ashes, and (which was the greater part) stamp'd Bricks and Potsherds, in grains not larger than Cabbage-Seed, and the Flower or fine Powder separated from it. This Bed was about half a Foot thick; and is what *Vitruvius* calls the *Nucleus*. Whether we may call it Terrace, I must leave it to those who are better skill'd than my self, in giving proper Appellations to the several parts of Masonry. Both this *Nucleus* and the *Rudus* under it, very near equall'd the *Portland* Stone in hardness and compactness. Upon this *Nucleus* or Terrace were the *Tesseræ* set; they were set an end: but so exact was the Workman in setting them, that he us'd two sorts of Cement to fix them withal; their lower ends stood in a Cement of Lime only, well work'd; their upper halves were cemented with a fine gray Mortar, consisting of fine Sand (and as it seem'd) Ashes and Lime. This gray Cement every where fill'd the Intervals at their Heads; and was much harder than the *Tesseræ* themselves.

'Twas before intimated, that the *Tesseræ* were but of two Colours, White, and of a dark Brown; they were harder than a glaz'd and well burnt Tobacco-Pipe, and of a Grit somewhat finer; the Brown seem'd to be of the same Substance with the White, but colour'd by Art, (as *Pliny* informs us<sup>k</sup> the Workers in Clay of old had a method to do;) they seem to have been form'd in a Mould, and afterwards Burnt. Hence I am inclin'd to take the meaning of *Vitruvius*; where he makes so plain a distinction between the *Tesseræ*, and the *Scætilia*; that the one was according to the Import of the Name, form'd by Instruments out of Stone, Brick, and Tile; the other shaped in a Mould and Burnt. They were not of an equal size, none exceeding an Inch in length; the shortest were  $\frac{6}{10}$  of an Inch; most of them were equally made their whole length; but of some the lower ends terminated

<sup>k</sup> Plin. Secun. Hist. Mund. Lib. XXXV. c. 12.



almost as sharp as a Wedge, on purpose, as may be suppos'd, to be driven where any Interstices were left: At their Heads likewise they were not all equal and alike, some exactly Square, some oblong Square, some Semilunar, but none Triangular; the Diameter of those that were Square was about  $\frac{4}{7}$  of an Inch; the longest side of those that were oblong at the Head little exceeded half an Inch. It may be observ'd, that the preparations for fixing this Pavement here, go beyond those which *Vitruvius* prescribes (in the firm Wall near six Foot below the Surface, in the Bed of Clay within it two Foot thick, and in the Foundation of Brick under the Clay). But when we consider the Situation of the Ground here is low, not many Feet higher than the Sea might be elevated at Spring Tides; and that it might as well be annoy'd by Land-Springs after great Rains, as by Water owzing through the Earth from the Sea so near; from which the Work in time might receive damage: we must allow the abovemention'd Additions to be the result of a very judicious Foresight.

The Bath also was form'd and secur'd by a very compact Wall, of the same breadth and depth with that on which the Pavement rested; the Wall, which sustain'd the North Side of the Pavement, made the South Side of the Bath. On the South Side of the Bath, from the East end, to the ends of the Stairs, there was a solid Seat; twelve Foot nine Inches long, very near ten Inches broad, and fourteen Inches high. The Bottom or Floor of the Bath, was made after the same manner as the Pavement was made, excepting the *Tesseræ*, and the thick Bed of Clay; for under all, there was Brick; then a Bed of the *Rudus* or coarse Mortar somewhat more than a Foot thick; above that the *Nucleus* or Terrace only, half a Foot thick. The Sides of the Bath, the Seat, and the Stairs, were plaister'd over with this Terrace about half an Inch thick; all which were throughout so Hard, Compact, and Smooth, that when first open'd, the whole seem'd as if it had been hew'd out of one intire Rock and polish'd. At the middle of the East end, at the Bottom, there was a Sink-hole, a little more than three Inches long, and above two Inches deep; about four Inches above it, there was another passage through the Wall of the same size; the first we may suppose to let out the Water which had been us'd; the other to let in fresh. The Stairs and Seat were chiefly made of *Roman* Brick, between fifteen and seventeen Inches long, between eleven and twelve broad, and near one and an half thick. At the North Side of the Bath the Ground was not open'd; but at the East end of the Bath and Pavement, at the South Side of the Pavement, and at the West end of both there seem'd to have been several Vaults or Cellars; for there were very firm 23 Inch Walls continued every way (to the farther ends of which we did not trace) whose Foundations were as low as that which supported the Pavement; so that to the depth of six Foot, the Ground was fill'd with such Rubbish as was taken out of the Bath. The Bricks in this Rubbish, which were all broke, had several degrees of thickness, from three Inches to a little more than one Inch; some had one of their Sides wav'd as in *Fig. 2.* some Fretwise as in *Fig. 3.* others had Roses on them well imitated; we found also two sorts of chanel'd Bricks; the one



like a Trough, the Chanel three Inches broad, and as many deep, the Brick itself an Inch and an half thick: The other sort, had a Cylindrical Chanel; so that when two were clapt together, they form'd a hollow Cylinder of three Inches Diameter. These chanell'd Bricks being all broken, their Length when whole is uncertain, as is the Use they serv'd to; whether for Passages to convey Water; or whether they were placed in the Walls to distribute Heat throughout the Building, as was usual in the ancient Structures at *Rome*.

'Tis farther observable, when the Ground was open'd the second time; that off from the South-West corner of the Pavement, which the Letter G shews; five Foot lower than the Surface of the Pavement, there was discover'd a large Space (to the end of which we did not search) pav'd with Brick, eleven Inches broad, almost one and an half thick, and fifteen long; substantially was it pav'd; for it had two Courses of this Brick. There was half a Foot of Mortar under the lower Course; and about an Inch of Mortar between the two Courses; these Bricks also were perfectly well made; but on the under Side of each, were two Knobs, about the size of half a Walnut; fix'd on them as may be guess'd, to keep them steady, till the Mortar they were set in might dry. This pav'd Place was searcht 6 or 8 Foot every way; it was all cover'd with a Coat about two Inches thick, of Ashes and large Coals of Wood: On that lay confusedly large pieces of the *Rudus* or coarse Mortar abovemention'd, and lumps of the *Tesseræ* in all respects like those on the Pavement, and cemented as they were. There were moreover mingled with the Ashes many large Iron Nails, bigger, but not quite so long, as those we call double Tens; some Hooks for Doors to swing on; several small pieces of earthen Ware; some like bits of Urns; some of a fine yellow clay; some red, thin, neatly wrought and adorn'd with Flowers; and lastly part of a human Skull, and pieces of Bones near it; which Bones were not inclos'd in any Vessel, but lay loose; they were discolour'd like those I have seen in Urns; so that the Body they belong'd to, might perish by the same Flames, that these Buildings were destroy'd by. There was no Inscription found either on Stone or Brick; no Statue, or other Figure, save those on the Bricks mention'd; neither were there any Coins met with there. But something more than a Furlong North-West of these Works, near three Years since was a Malt-house, and near two Years since a Dwelling-House erected; in digging the Foundations for the first, there was a Coin of *Posthumus*; and in the Ground dug for the last, a piece of *Constantine's* found.

From the nearness of the Bath, it may reasonably be concluded that the Pavement was neither a part of a Temple, nor for a place of Justice: the continuation of the Foundations every way to be traced from it, and what was last discover'd, are rather an Argument it was an Apartment of a magnificent Palace.

*Pliny* suppos'd that these *Lithostrota*<sup>1</sup> or tessellated Pavements had their original in *Greece*; but perhaps the *Grecians* borrow'd their Patterns from

<sup>1</sup> Plin. Nat. Hist. Lib. XXXVI. c. 25.



*Asia*: for from the Book of *Esther*<sup>m</sup> we learn, there was a most Royal Banquet at *Suza*, on a *Lithostroton* (so the Septuagint has it) of costly Stones, four hundred Years before the time of *Sylla*, who brought them first into *Italy*. *Josephus* affirms<sup>n</sup>, that the *Grecian* Laws, Learning and Arts were fetch'd from *Asia*: and indeed when we reflect on the Antiquity of the *Levitick* Law; the Pyramids of *Egypt*; the Temple of *Solomon*; the Walls and Palaces of *Babylon*; and the sumptuous remains of *Palmyra* and *Persepolis*; we have no reason to esteem the *Grecians* Authors, but as good Imitators of those early Examples of Learning and Arts they had to follow.

When *Quintus Cicero* was here with *Cæsar*, the second time he invaded *Britain*; his Brother the incomparable *Tully*, had the oversight of some Buildings he had appointed to be made in the *Villa Manliana* at *Arcano*: and in a Letter sent into *Britain*, *Tully* informs *Quintus*, that he was well pleas'd with the Seat, and more, because the *Pavimented Piazza* was Magnificent: that the Pavement seem'd<sup>o</sup> to be exactly well made: that he had directed some Chambers to be alter'd because he did not approve of them: that in the Bathing Apartment, he had remov'd the Sweating Room into another corner of the *Apodyterium*. And afterwards in the same Letter makes mention of such another Work which was in hand for him in the City also. Again, about the time *Quintus* return'd out of *Britain*, and was fixt with the Legion he presided over, in Winter Quarters among the *Nervii* (of which *Cæsar* in his Commentaries makes mention); *Tully*<sup>p</sup> takes notice of a Pavement that was making for himself also: *Expolitiones utriusque nostrum sunt in manibus; sed tua pœne ad tectum jam perducta res est rustica Arcani & Laterii*. 'Tis hinted by *Varro* that a *Lithostroton* was one of the Members of a compleat *Villa*<sup>q</sup>: *Varro* was eighty Years old when his Books *de Re rustica* were composed: *Tully* was something more than fifty when the above cited Epistles were wrote; *Cæsar* when a General, made the *Tesseræ*<sup>r</sup> and *Sectilia* for Pavements, to be part of his Baggage; and *Vitruvius*, Cotemporary with these three, calls the *Lithostrota*, *Principia Expolitionum*<sup>s</sup>; which make it evident these Floors were held in esteem, by as great Men as the World has afforded, even in their riper Years. From all this, we may observe, that sometime before, and in the first Age of the Empire, the humour of these kinds of Floorings much prevail'd among the *Romans*: wherefore 'tis no wonder they are found in so many places of this Island. But, as unprofitable Inventions and Customs in time grow Stale, and are laid aside, so fared it with that of the Pavements: For in the time of *Pliny* they began to be out of use on the Ground; but then he tells us, they were made above Stairs<sup>t</sup>, or in his own Words in Chambers. Whether the *Lithostrota* in Chambers were usual in *Vitruvius*'s days, we have no Warrant to suppose,

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<sup>m</sup> Esth. Chap. I. v. 6. <sup>n</sup> Joseph against Apion. Book II. <sup>o</sup> Tull. Cic. ad Quinct. Frat. Lib. III. Ep. I. <sup>p</sup> Ibid. Ep. III. <sup>q</sup> Ter. Varro de Re rustic. Lib. III. <sup>r</sup> Suet. Tranq. Jul. Cæs. Cap. 46. <sup>s</sup> M. Vitruv. Pol. Lib. VII. Cap. I. <sup>t</sup> Plin. Hist. Lib. XXXVI. Cap. XXV. *Pulsa deinde ex humo Pavimenta in cameras transiere è vitro; novitium & hoc inventum.*



from any hint in his Writings; notwithstanding he gives Rules for making them, *plano pede*, on the Ground; and *sub<sup>u</sup> dio*, (which from the Method by him prescrib'd must be) aloft: because for sustaining those *sub dio*, he orders the Work underneath to be well secur'd, with two lays of Plank that should cross <sup>w</sup> each other, and be nail'd down; then the *Statuminatio* or Pitching the Mortar, Terrace and *Tesseræ*; as before on the Ground. But because by *sub dio* *Vitruvius* could not design Chambers; and although *Pliny* informs us the *Græcians* us'd <sup>x</sup> to cover or Flat-roof their Houses with these Pavements; yet since neither *Vitruvius* nor *Pliny* mention any such Mode prevailing in their times at *Rome*; it remains, that we may imagine *Sub dio*, or the *Subdialia* of *Vitruvius*, to mean Pavements mounted on Pillars or Arches, which might afford delightful Terraces out of the upper Rooms, and shady Piazzas underneath: and in this Sense perhaps may be understood the *Porticus Pavimentata* of *Tully* above-mention'd. By the many Apartments the Foundations about these Works point out, there seems to have been nothing wherein the Buildings that once stood there, might come short of the magnificent Structures, wherewith the *Romans* delighted to gratify their Luxury. The uses each were design'd for, are not to be determin'd: whether there was a Piazza cover'd with a *Lithostroton*, cannot be affirm'd. But be that as it will; 'tis next to Demonstration, there was some upper Floor sustain'd by Wood, and pav'd with the *Tesseræ*, after the same manner as *Vitruvius* directs; and, on the Brick Pavement (last discover'd,) the Coat of Ashes and Wood Coals with Nails; cover'd with large pieces of the *Rudus*, and great lumps of the *Tesseræ* well cemented together; and the *Nucleus* adhering to them, shew there was an upper Pavement broke by its Fall, when Fire had consum'd its Support.

2. We cannot have a less Sense of the Rules and Methods the *Roman* People made use of, in framing their Buildings and other Conveniences for Enjoyment and Magnificence, than of their Managements in Military Preparations and Discipline: When they design'd a Building, they could not immediately begin it; their Preparations requir'd Time. *Vitruvius* <sup>y</sup> and *Pliny* both direct that Brick be form'd in the Spring, and be two Years drying. And *Pliny* <sup>z</sup> says, 'twas ordain'd by the old Laws of *Rome*, that no Undertaker should build a House with Mortar, that had not been made three Years before.

Of the Site of  
some Roman  
Towns in  
Suffex, by the  
same. n. 356.  
p. 783.

2. Where *Tacitus* speaks of *Britain* and its Affairs, his Descriptions are so lively deliver'd, that one would think himself had been here, with his Wife's Father *Agricola*; and where he mentions the *Irish* <sup>a</sup> Prince, the Expression by him us'd seems to give Strength to such a Supposition.

<sup>u</sup> M. *Vitruv.* Lib. VII. Cap. I. Sub dio vero maxime idonea faciunda sunt pavimenta.  
<sup>w</sup> Ibid. itaque si necessitas coegerit, ut minime vitiosa fiant, sic etit faciundum; cum coaxatum fuerit, super altera coaxatio transversa sternatur, clavisque fixa, &c. — Statuminatio facta rudus inducatur, &c. <sup>x</sup> Plin. Hist. Lib. XXXV. Cap. XXV. Subdialia Græci invenire talibus domus contegentes. <sup>y</sup> M. *Vitruv.* Fol. Lib. II. Cap. III. Plin. Hist. Lib. XXXV. Cap. XIV. <sup>z</sup> Plin. Hist. Lib. XXXVI. Cap. XXIII. <sup>a</sup> Tacit. Vit. Agric. cap. XXIV.



The gaining the Southern part of this Island, was the greatest, if not the only Acquisition, made to the *Roman* Empire, from the Death of *Tiberius* to the Sixth Year of *Claudius*; which we may well suppose was not pass'd over in silence by that excellent Historian *Tacitus*: But his Four Books of Annals, which contain'd the Transactions of those Nine Years, we have reason enough to fear, are irretrievably lost. From the mention *Suetonius* makes of *Claudius* his Expedition hither; 'tis commonly insinuated his Conquest here<sup>b</sup> cost no Blood. Our Countryman *Bede*, we may see, was of that opinion; because, in the Account given by him of *Claudius*, the Words of *Suetonius*<sup>c</sup> are copied. But *Dio Cassius*, from whom we have the most particular Information of that War, gives a quite different Relation of the Matter: He takes notice of at least Four Battles, fought with the *Britons* (before *Claudius* came over) by *Aulus Plautius*; who had *Flavius Vespasianus*, *Flavius Sabinus*, and *Hofidius Geta*, that commanded under him: In the first Conflict, *Cataratacus* was defeated; in the second, *Togodumnus*, and, as may be inferr'd from his Words afterwards, slain. From the manner of his delivering the Story, all those Battels seem to have been fought, South of the River *Thames*, and North of the *Sylva Anderida*, except the last; and that in the first Campaign the Conquests of *Plautius* could not have extended beyond *Kent* and *Surry*: For it's likely<sup>d</sup> that the Two first Actions happen'd about the Skirts of the *Sylva Anderida*, Eastward of the River *Medway*; and the Third, which held Two Days, on the Banks of that River; because, from the River, where they were routed Two Days successively, the *Britons* retiring, assembled<sup>e</sup> their Strength again before their Fourth Overthrow, in that part of *Kent* which borders on the *Thames*, not far from its entrance into the Sea; and having pass'd it, were follow'd by *Plautius* his *Germans*, and on the other side put to flight; which was the Fourth Action mention'd by *Dio*. *Claudius* having been sent for, comes the Second Year with powerful Succours to the Assistance of *Plautius*; who with his Forces waited his Arrival near the *Thames*, not unlikely still where he quarter'd in the Winter; which perhaps was in that large strong Camp, as yet to be seen<sup>f</sup> not far from *Bromly* in *Kent*, on the River *Ravensbourn*. The Emperour joining him<sup>g</sup>, immediately cross'd the *Thames*; overthrew the *Britons* posted on the other side to resist him; advanced to *Cynobelin's* chief Residence *Camalodunum*, and took it: Then receiving Homage of some States, return'd to *Rome*.

Considering therefore that *Claudius* staid but sixteen Days<sup>h</sup> in this Island, we must conclude his Dispatch was great; and that his Progress could not have been through more Parts than *Kent*, *Essex*, *Hertfordshire*, *Middlesex*, and *Surry*. As to what else relates to the *British* War in the time of *Claudius*, save that three Years after *Titus* rescued his Father *Vespasian* when in great danger, we have no Account from *Dio*. But where *Suetonius*<sup>i</sup> treats

<sup>b</sup> Suet. Claud. cap. 17. <sup>c</sup> Beda Eccles. Hist. Gent. Angl. Lib. I. cap. 3. <sup>d</sup> Dionis Cassii Hist. Rom. Lib. LX. Claud. V. p. 768. A. <sup>e</sup> Pag. 678. D. <sup>f</sup> Camden Brit. Edit. 1695. Col. 213. c. <sup>g</sup> Dion. Cassi. Hist. Rom. Lib. LX. pag. 679. B. <sup>h</sup> Dion. Lib. LX. pag. 680. B. <sup>i</sup> Suet. Vespasian. cap. 4.



of *Vespasian's* Life; we are told, that when that Emperour commanded in *Britain* for *Claudius*, he fought thirty Battels, subdu'd Two of the most powerful Nations, won twenty Towns, and brought the Isle of *Wight* under the *Roman* Obedience. Of which Actions, besides what might have been said in the lost Books of Annals; *Tacitus*, in other Pieces of his, largely <sup>k</sup> hints; that when *Claudius* rul'd, *Vespasian's* Behaviour and Success in this Island, shew'd to the World his Conduct and Courage in the Affairs of War: The same is also taken notice of <sup>l</sup> by *Dio*. From his Conquest of the Isle of *Wight*, it may be imply'd, the Stage of his Actions here, was in those Countries which border on the South Channel rather than in the North: Since therefore the Clime, the Soil, and the more ready Conveniencies for foreign Trade and Correspondence, might entitle this Part of the Land, to sustain as numerous, as stout, and as experienc'd a People as any other (because *Cæsar* <sup>m</sup> takes notice they not only lent Aids to the *Veneti* in their Revolt, but were wont to assist the *Gauls* in most of their Wars against <sup>n</sup> the *Romans*;) And whereas no Historian afterwards mentions any Disturbance given to the *Romans* from the Southern Parts; we may conclude, *Vespasian* entirely subdu'd them; and that before he left the Island, the Methods he establish'd for securing Peace were no way inferior to those he had shewn in making War.

The *Romans* well knew, that those who were Strangers to Civility, could not without great Difficulty be kept in Obedience: As soon therefore as the Countries they had conquer'd, were reduced to some degree of Quiet; they endeavour'd to make the People in love with their Government, by introducing their Arts and Customs among them: From that inconsiderable Instance recorded <sup>o</sup> by *Pliny*, we may see, how ready the *Romans* were to oblige the People under their Power with any Curiosity that might entertain their Senses, in order to endear them to the Authority they had over them. (He tells us, Cherries were not known in *Italy*, till the 680th Year of *Rome*, when *L. Lucullus* first brought them thither from *Pontus*; and that in a Hundred and Twenty Years, they were so increas'd, that not only many other Countries, but *Britain* also was supply'd with them; which must have been about three Years after *Claudius* himself had been here. The usual Landing from *Rome* being then in the County of *Kent*; that Fruit without question was there first planted; and the Soil well agreeing with it, may be the reason that the best and greatest Quantity of it is yet there to be had.)

*Agricola*, in the Second Year of his Lieutenancy here, when in Winter-Quarters, pursu'd the same Maxims (which *Tacitus* terms *Saluberrima Consilia*; and, as it may be inferr'd from an Expression of <sup>p</sup> *Cæsar* conducive to the same End) to gain the *Britons*, by making them acquainted with the *Roman* Manners: He not only in private persuaded, but publickly help'd and

<sup>k</sup> Tacit. Agricol. cap. xiii. Tacit. Hist. Lib. III. cap. xlv. <sup>l</sup> Dion. Cass. Hist. Rom. Lib. LXV. p. 736. C. <sup>m</sup> De bello Gal. Lib. III. <sup>n</sup> Idem Lib. IV. <sup>o</sup> Plin. Lib. XV. cap. xxv. <sup>p</sup> De Bell. Gallic. Lib. I.



incourag'd them to build Temples, Places for common Assemblies, and private Houses after the *Roman* Mode: He took care to have the principal Youth instructed in the Liberal Arts: He allur'd them to affect the Habit of the *Romans*: And at last of all to engage them the more firmly, help'd them to a Taste of the *Roman* Luxury and Goodfellowship, by introducing the Use of shady Piazzas and Baths<sup>a</sup>, and their way of Banquetting. But here, *Tacitus* may be understood to speak of what was done in order to civilize the Northern Parts of this Nation, where *Agricola's* Presence was required: The Southern was, we may suppose, softened and quieted by the same Methods near forty Years before, when reduced by *Vespasian*.

From hence it may be inferr'd; that should never any other Tokens of the Antiquity of these Works be found; yet would the *Bath* denote the Age of the Pavement, and set it near as high as the most early Time, that the *Romans* had any real Authority in this Island.

As by the Loss of some of the Annals of *Tacitus*, we may have been depriv'd of the most early History of this County; so likewise, for want of antient Religious Houses; there has been little or no Account left of its Circumstances, in the Times next after the *Roman* Authority expired here. *Malmsbury*<sup>b</sup> says, that in his Time, there were here only the Abbies of *Battell* and *Lewes*, and those not long erected. The earliest Mention made of it, is by <sup>c</sup> *Bede*, who informs us, that Bishop *Wilfrid*, in the Year 678, being thrust out of his Province of *Northumbria* by King *Ecgfrid*, settled at *Selsey* in 680, and staid five Years, labouring in the Conversion of the neighbouring Parts; but of what else relates to the County, save the miserable Ignorance of the Inhabitants, and the Number of Families, he has left no Account. *Bede* spent most of his Time in the Monasteries of *Wiremouth* and *Jarrow*, and travel'd little; so that [considering the Distance from thence to this County, and the different Governments and Interests that lay between, he may well be excus'd for the few Particulars he has left us of it.

The next Records we have to view are those of *Ethelwerd*, the *Chronicon Saxonicum*, and *Henry* Archdeacon of *Huntingdon*. But that you may the more clearly apprehend the ancient State of this County; look into the best Map of it you can get. At the West End, you will find *West-Harting* and *Stansted*, distant from each other six or seven Miles; imagine a streight Line to be drawn from *Harting* to *Bourne* near *Pevensey*, and another to be drawn from a Point which must be little South of *Stanstead* to *Brighthelmstone*: What lies North of these Lines is the Weald or Low-lands, formerly the *Sylva Anderida*; that which is comprehended between these Lines, and bounded by the Sea from *Brighthelmstone* to *Bourne*, is the *Downs*, so famous for their pleasant Situation and Fruitfulness. The Part South of these Lines, is a flat champaign Ground, ending like a Wedge at *Brighthelmstone*. These two last Parts were those only that were inhabited in *Bede's* Time;

<sup>a</sup> Tacit Agricol. cap. xxi. <sup>b</sup> Gul. Malm'sb. de gestis Pontific. Angl. Lib. II. <sup>c</sup> Bedæ Hist. Eccles. Lib. IV. cap. xiii.



they contain not more than Two Fifths of the whole County; which must be the reason why *Bede* said, *Suffex*<sup>d</sup> consisted not of more than 7000 Families or Farms; whereas in another place he computes *Kent* to have 15000 Families.

In the three Accounts<sup>e</sup> above-mention'd, 'tis agreed, that in the Year 477. *Ella*, with his three Sons *Cymen*, *Wlencing*, and *Cissa*, landed his Forces at *Cymenes-Ora* (which from a Charter of King *Cedwallas* to the Church of *Selsey* the learned<sup>f</sup> *Camden* proves to be about *Wittering* near *Selsey*;) not far from which he routed the *Britons*, and drove them into the *Weald* (*Andredesleige*): Their farther Progress is most distinctly and naturally deliver'd by the Archdeacon of *Huntingdon*, in these Words; *Saxones autem occuparunt littora Maris in Sudsere, magis magisque sibi regionis spatia capefentes, usque ad nonum annum adventus eorum. Tunc verò cum audaciùs regionem in longinquum capefferunt; convenerunt Reges & Tyranni Britonum apud Mercredesburne, & pugnaverunt contra Elle & filios suos, & fere dubia fuit victoria. Uterque enim Exercitus valde læsus & minoratus, alterius congressum devovens, ad propria remearunt. Misit igitur Elle ad compatriotas suos auxilium flagitans.*

This County having been invaded in the most Western part of it by the *Saxons*; if what they did afterwards, was to possess themselves of it, their Progress must have been from West to East: And so much *Henry Huntingdon's* Words plainly imply. He says farther, they were eight Years about it; which, if we consider the Circumstances of the Country, 'twill be no great wonder it should take up so much Time; unless the Forces had been very great, which we have no warrant from any History to suppose: For the *Weald* then uncultivated, must have been most difficult to pass, even in the driest Summers. The *Downs*, like a Wall (with a Terras-Walk on the top) have a very steep Descent into it, their whole Length; excepting, that every ten Miles, or thereabouts, they have deep Channels through them to afford Passage for the Rivers into the Sea: Therefore, what was then habitable, being thus canton'd out into so many Parcels by the Rivers; nothing could be more difficult to gain than those Cantonments; were there any Forces to defend the Passes that should have been attempted; the Rivers being deep and muddy, and the Morasses on each side broad and boggy: Hence we may conceive, 'twas no very difficult Task for the *Britons* to defend, nor an easy one for the *Saxons* to gain the Country. And indeed, the many old Camps, still to be seen on the *Downs*, are an Evidence that scarce any part escaped being a Scene of War. Mr. *Camden* mentions but two, *Cissbury* and *Chenkbury*. In the new Edition of his Works, Dr. *Harris* has added three more; a *Roman* Camp at the *Brile* near *Chichester*, *St. Rooks-hill* and *Gons-hill* near the West Limits of the County. It may not be improper here to insert an Account of the rest; in which, I shall

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<sup>d</sup> Bedæ Hist. Eccles. lib. IV. cap. 13. <sup>e</sup> Ethelward Hist. Lib. I. cap. 5. Chronic. Saxon. Ann. CCCCLXXVII. Hen. Hunt. Hist. Lib. II. <sup>f</sup> Camden. Brit. Suffex.



first take notice of those that are on the North Edge of the *Downs*, and overlook the *Weald*.

First, *Chenkbury*, mention'd by Mr. *Camden*, two Miles West of *Steyning*, and about three Miles North of *Cissbury*; 'tis circular; its Circumference about two Furlongs. From *Chenkbury* eight Miles East, over *Poynings*, is a very large one, an Oval, not less than a Mile round; accessible at one narrow Neck only, and that fortify'd with a deep broad Ditch, and a very high Bank: I could never learn any other Name it has gone by, than *Poor-Man's Wall*; perhaps from its having been a Security to the distressed *Britons*. About three Miles East from thence, is *Wolsenbury*, on a Hill, projected beyond the rest of the *Downs*, like a Bastion; it comes near a Circle in shape; its Diameter a little more than a Furlong. Near three Miles East of *Wolsenbury*, on the highest part of the *Downs* in that Quarter, is a Camp, near square, about 60 Rods long, and 50 broad; much like a *Roman* Camp; the side next the North is secur'd by the Precipice of the Hill, which is both very deep and steep; the other three Sides have each their *Portæ* after the *Roman* manner still very visible; the Ditch seems to have been not less than eleven Foot broad; but the Ground having been plough'd, the Bank is but low: This is call'd *Ditchling*, as is the old Town under it. Near seven Miles farther East, and a Mile and half East of *Lewes*, is the last on the North Edge of the *Downs*; it goes by the Name of *Caburn*, which perhaps is but a Corruption of the *British* Word *Cadir*; the Parish below it, still retains its *British* Name *Glynd*: This is a round Camp, scarce three Furlongs in Circuit; its Ditch very broad and deep, and the Rampart within very high; the Places where the Tents were pitch'd are yet visible; which, from the Strength of the Out-Works, intimates that those within held it no small time. Near a Quarter of a Mile West of it, there is a strong work much larger, but not so perfect; yet enough to shew, it was made to secure a Power, that might lie there to bridle those in the strong Camp, and prevent their making Excursions towards *Lewes*.

The Camps on the Southern Limits of the *Downs*, are *St. Rooks* near *Chichester*. *High-Down*, a small Square four Miles East of *Arundel*, and in the Parish of *Goring*. *Cissbury* four Miles South-West of *Steyning*. *Hollingbury* is the only one in the middle of the *Downs*, two Miles North of *Brightelmstone*, and three Miles South of *Ditchling*; 'tis a Square; the *Portæ* still remaining; it contains about five Acres. A Mile East of *Brightelmstone* on the top of a Hill, half a Mile from the Sea, is a Camp, which has a triple Ditch and Bank; this also is a Square, only the Corners are rounding; the outmost Trench measures about three Quarters of a Mile. In the Parish of *Telscomb*, about five Miles East of the last, are two, but both imperfect; the Cliff is a South-Fence to one, the other is a Mile distant from it; their West Sides are both finish'd with very able Works; they were design'd for Squares, and to contain 12 or 15 Acres. At *Meeching* or *Newhaven*, on the Point of the Hill, which overlooks the Harbour's Mouth from the West, is a Fortification which they call *the Castle*; its Banks are very high, the Shape near half oval, containing about six Acres;



formerly it might be much more, because the Cliff, which forms the Diameter, every Year more or less moulders away, and falls into the Sea. Near a Mile East of *Seaford* is another call'd also *the Castle*, bounded by the Cliff on the South; its Figure almost semicircular, the Trench and Rampart large, inclosing twelve Acres. Three Miles East of *Cukmere Haven* is the last, near a narrow Pass coming up from the Sea call'd *Burling-gap*; it incloseth a Hill nam'd *Belltout* of a half oval Shape; the Works have the same Figure, and measure about three Quarters of a Mile; the Cliff here also makes the Diameter.

Though neither History nor Tradition has handed to us any Relation, when either of these Works were made or by whom us'd (except *Cissbury* by *Cissa*) yet from this View we may conceive, the Calamity of War once rag'd in all these Parts; that the Ground was disputed Inch by Inch; that in the Attack, as well as Defence of it, the Pick-Axe and Spade were as much made use of as the Sword; and lastly, that unless the Aggressors were very numerous, eight Years was no long time taken up, in dispossessing the Inhabitants of this fast Country.

Some may imagine, many of these Camps were made by the *Danes*; but by what may be observ'd from the History of those Times, that People seem'd not to be so formal an Enemy, as to prolong War by Encampments: Their Refuge was in their Fleets that always attended them; so that, when likely to be vigorously oppos'd, they betook themselves to their Ships, and suddenly invaded another Part, where was less Opposition; and what they could not carry with them, consum'd with Fire and Sword. Thus continually harassing the Nation by their hasty and rapacious Visits, they exhausted it of its riches and strength, and as it were imitating the quality of the Faulcon their ensign, they flew the prey to a Stand, and then seiz'd it.

The Archdeacon of *Huntingdon*, in the Prologue or Dedication of his Annals, to *Alexander* Bishop of *Lincoln*, assures his Diocesan, that he compil'd his History from Chronicles reserv'd in ancient Libraries; no question therefore, when speaking of the *Saxons* here, he had good Authority to say (as above cited), *magis magisque sibi Regionis spatia capeffentes*; and that no other meaning could belong to it; than that they carried their Conquest from West to East, *in longinquum*, lengthways. Had they entirely made themselves Masters of the Country, 'twould have been too late: But before they had wholly gain'd it, the *Britons* assembled against them; the *Saxon* Chronicle says *neah*, i. e. *propè*; *Ethelwerd*, *juxta*; or, as *Huntingdon* has it, *apud Mercereðesburne*; where a Battle was so hard fought, that each Side had enough on't, and retir'd. The *Saxons* were so diminish'd, that *Ella* was oblig'd to send for more Forces. This Action was in the ninth Year after *Ella's* first footing here, three Years before *Hengist's* Death, *Ann. Dom.* 485. It so weaken'd *Ella*, that we hear no more of him till he receiv'd his Supplies from *Germany*; which came not, according to *Henry Huntingdon*, till the first Year of the Emperor *Anastasius*, three Years after *Hengist's* Death, and six Years after the hard Battel, *viz. An. Dom.* 491.



Being thus strengthned, *Ella* mov'd again, besieg'd *Anderida* (in *Huntingdon's* Words, *Urbem munitissimam*) at last forced the Place; and by reason of the stout Resistance the Defendants made, Savage like, left not a Soul alive, and ras'd the City, which in *Huntingdon's* Time remain'd desolate.

As to the Field where the Battel was fought; the *Saxons* extending their Power Eastward, the Check that was given them, in all probability must have been where they push'd on their Victories; and it being near *Mercere-Desburne*, this *Bourne* near *Pevensey* may be the Place meant, since it sounds like the latter part of that Name (for there not being a *West-Bourne* that it relates to, the Name of it may rather be *Esbourne* than *East-bourne*;) and likewise that *Anderida*, the *Britons* last Stake and Support, was not far from it. 'Tis probable therefore the Battel was fought on the *Downs*, between the Camp last mention'd at *Burling-Gap* and *East-Bourne*; for there are no where on the *Downs*, that I have seen (and there are few Parts of them that I have not often view'd) Marks of a greater Battel than there; because, from the top of that very high Cliff, by the Inhabitants call'd *The Three Charles* (and by Mariners *Beachy-Head*) to *Willington Hill*, which is four Miles, the Ground is full of large *Tumuli* or Places of Burial; and in many parts within that Tract, where the Position of the Ground seems to offer, there are deep Trenches and Banks, which one would imagine were Breast-Works made to defend the Front of an Army; and the *Tumuli* on each side of them seem to shew, there was no small Struggle, in forcing as well as defending them.

The Learned and Judicious Mr. *Somner* dislikes, that the Site of *Anderida* should be fix'd at *Newenden*, and is inclin'd to assign some Place in *Suffex* for it: But from a modest Deference to the Opinions of the Learned *Camden* and *Selden*, he drops the matter.

But let us see, what our more elder Historians say of it; *Henry* of *Huntington's* Words are, *Et quia tot ibi damna toleraverunt Extranei, ita Urbem destruxerunt, quod nunquam postea reedificata est. Locus tantum, quasi nobilissimæ urbis, transeuntibus ostenditur desolatus. Matthew* of *Westminster* says, *Locus autem Civitatis usque hodie transeuntibus ostenditur desolatus. Mansit ergo ibidem Ella cum tribus Filiis suis, & Regionem illam, quæ usque hodie Anglicè Suthsex, Latine autem Regio Australium Saxonum dicitur, colere cœpit.* From the Expressions above cited, it may be suppos'd the Ground where that City stood was not quite forgot, in either of those Historians Days. *Henry* of *Huntingdon* being the elder by 200 Years (had *Newenden* been the Place), his Words might have been true, in saying it was desolate: But 'tis very improbable *Matthew* of *Westminster* should have said so likewise; or at least, not taken notice of the Act of Piety and Charity of Sir *Thomas Albuger*, who, in his Time, had newly erected a Monastery at *Newenden*<sup>h</sup> for the *Carmelites* who came from *Palestine*: But let that pass; what Authority Mr. *Camden* had for saying *Hengist* sent for *Ella* out of *Germany*, to help him reduce

<sup>g</sup> *Somner's Roman Ports and Forts in Kent*, p. 106. <sup>h</sup> *Camd. Brit. Kent. Edit. 1695.*  
Col. 215.



*Anderida*, is not to be found. From the Accounts above stated, and others that might be produced, it is clear, that *Hengist* was dead Three Years before the Siege was laid to *Anderida*. In the Time of *Hengist*'s Life, we find, for Eight Years *Ella* had enough to do in *Suffex*; and the Blow he had given him the ninth Year at *Mercredesburne*, oblig'd him to be quiet the other two Years of *Hengist*, and till his Succours (as above-mention'd) came to him from *Germany*. Besides, we have not the least Hint from any of our Historians, that *Anderida* was an Eye-fore, either to *Hengist* or his Son *Esk* after him; or that *Ella* assisted the *Kentish Saxons*, or the *Kentish Saxons* *Ella* in reducing it: Therefore this must be a Supposition only of Mr. Camden, in order to give Strength to the Notion of *Anderida*'s being at *Newenden*. Taking no notice therefore of that Supposition, we may consider *Newenden* is on the *Kent* side of the *Limen* (for so is the River *Rother* call'd <sup>h</sup> in the *Saxon Annals*, and by *Matthew Westminster*, and the Mouth of it nam'd *Portus Limeneus*, and *Limene* by *Ethelwerd* <sup>i</sup> and *Henr. Huntindon*;) and that *Kent* having been subdued by *Hengist* and his *Saxons*, near forty Years before; the Town at the Mouth of the *Limen*, and the rest, if any, up the Stream on the side of *Kent*, were also part of their Conquest.

Furthermore, after it had cost *Ella* so much Time, and no doubt Pains too, in reducing the plain Ground of *Suffex*, 'tis not likely he should call more Forces out of *Germany*, that he might lead them thirty Miles, through the Difficulties of the great Wood (which he must have done if *Newenden* were the Place,) to besiege a City, so far from his own, and within the *Kentish-Saxon* Limits, especially if there's any heed to be given to the Words of *Math. Westminster* before cited; who, after relating the sad Fate of the Inhabitants and City of *Anderida*, immediately subjoins, *Manfit ergo, &c.* *Ella and his Sons resided there (i. e. in that part of Suffex where Anderida was,) and began to cultivate and improve the Country.*

In the last place, from the Use of *Anderida* by the *Romans*, 'tis not likely (as Mr. *Somner* <sup>k</sup> judiciously hints) its Place was at *Newenden*; for being one of the Stations, under the *Præfectus littoris Saxonici*, where Forces were quarter'd, to have a watchful Eye on the Sea, when ever the *Saxon* Pirates came to infest the Coast: We may suppose it, like the rest of the Garrisons under that Officer, conveniently situated for the same purpose, as were *Branodunum* <sup>l</sup> *Brancaſter* at the North Point of *Norfolk*; *Gariannonum*, *North-Yarmouth* or very near it; *Othona*, *Ithanchester* in *Dengy Hundred*, in *Essex*, some Ages since swallowed up by the Sea; *Regulbium*, *Reculver* in *Kent*; *Rutupis*, *Richborow*; *Dubris*, *Dover*; *Lemannis* (which from the *Saxon Chronicle* <sup>m</sup> we must look for, four Miles East of *Apple-dore*) probably *New Romney*, all situate near the Sea, on Ground which had a full Prospect of the Sea: whereas *Newenden* lies low, at least eight

<sup>h</sup> Chron. Sax. A. Dom. DCCCXCIII. Mat. Westm. Fl. Hist. A. Dom. DCCCXCIII.  
<sup>i</sup> Ethelwerd. Lib. III. cap. iii. A. Dom. DCCCXCIII. Hen. Hunt. Hist. lib. V. Alfr. Reg. an. 19. <sup>k</sup> Somner Rom. Ports and Forts, pag. 103. <sup>l</sup> Not. Imperii à Pancirol. cap. lxxiii. pag. 162. <sup>m</sup> Chron. Sax. A. Dom. DCCCXCIII.



Miles within *Appledore*, on a turning of the River, where the Land Eastward must have cut off any Prospect of the Sea. To all this may be added, that the *Romans* having a *Numerus*, Cohort, or Battalion of the *Turnacenses*, in Garison at the *Portus Lemani* on the Mouth of the Haven, we may suppose they knew how to husband their Strength to better purpose, than to place another Garison to watch the Motions of the *Saxon* Rovers, twelve Miles up the little River, quite out of sight of the Sea, where they could be of no Service.

Those who would have the Seat of *Anderida* to have been at *Hastings*; let them look on these Words of *Henr. Huntindon*<sup>n</sup> (*Haraldus rex Anglorum, eadem die reversus ad Eouirwic cum summa lætitia, dum pranderet, audivit nuntium dicentem sibi, Willielmus dux Normanniæ littora Australia occupavit, & castellum construxit apud Hastings,*) and they will conclude *Hastings* was not a desolate Place, in the Ages of the Historians, who affirm *Anderida* was: If at *Pevensey*; that Place was so far from being raz'd by *Ella*, that even after the *Norman* Conquest it remain'd a strong Castle, where *Odo*, Bishop of *Bayon* and his Forces sustain'd a Six Weeks Siege; and for want of Provision were oblig'd to surrender to K. *William II.* At this time there is so much of *Pevensey* standing, that perhaps 'tis the greatest and most entire Remain of *Roman* Building, any where to be seen in *Great Britain*.

From the Arguments on the foregoing Authorities, *Anderida* must have been somewhere in *Suffex*, not in the West but East part of it, and not far from the East End of the *Downs*, near the Sea. From the Bath, Pavement, Coins, and Bricks, 'tis sure the *Romans* had once an Abode, and not a short one; at this Place near *East-Bourne*: From the large Extent of Foundations about the Place where these were discover'd; that there was a large Town or City there: From the common Height those Foundations bare under the Surface of the Ground; that the Buildings they sustain'd were effectually levell'd or raz'd: And from the Coals dug up amongst the Rubbish, 'tis evident that Part was burnt; all which Circumstances well enough agree with the Account given us of *Anderida*.

The Situation likewise of a Town here, gives reason enough to suppose, it was a Place of Importance, and whence it had its Name; no Part hereabouts being any way so convenient, for a secure Settlement; or for such a use as the *Romans* might have occasion to make of it. We are inform'd by *Cæsar*, that the Maritime Parts of *Britain* (speaking of what he saw, which was the South-East) were inhabited by People from *Belgium*; and<sup>o</sup> that they call'd their Settlements by the Name of the Places from whence they came. It was the Opinion of *Tacitus* also, that<sup>p</sup> those who inhabited next to *Gaule*, came from *Gaule*. And *Bede* says, the Tradition in his Time was, that the Southern Part of the Isle was peopled<sup>q</sup> from *Bretaign*. In the Third and Seventh Books of *Cæsar's* Commentaries, mention is made

<sup>n</sup> *Henr. Huntindon*, Hist. lib. vi.    <sup>o</sup> *De Bell. Gall.* lib. v.    <sup>p</sup> *Tac. Agric.* cap. xi.    <sup>q</sup> *Bedæ* Hist. Eccles. Gent. Angl. lib. I. cap. I.



of the *Andes*, a City and a People belonging to it among the *Geltae*, inhabiting on the Sea-Coast. Time varying Names of Things, near Two Hundred Years after *Cæsar*, *Ptolemy* calls the City *Anderidum*: And near 250 Years after him, when the *Notitia Imperii*, now extant, was in use, the *Classis Anderetianorum*<sup>r</sup> is register'd; and the Residence of their Admiral fix'd at *Paris*. From whence 'tis to be inferr'd, that tho' the Capital of the *Andes* might have been *Angers* near the *Loyre*, yet their Country had on the North the *British* Chanel; and on the East the *Seine* for its Bounds. The *British* Coast about *East Bourne* is the nearest of any to the Mouth of the *Seine*: Therefore, according to the Usage before *Cæsar*'s Time, the Name of *Anderida* there, is readily accounted for. Moreover, this Place seems most naturally seated, for giving an Appellation to the great Wood, to which it adjoin'd: For, as it self is on the Shoar; so also the *Sylva Anderida* here came very near the Shoar; and a large part of it might be seen from the Sea before it: Indeed, on the Sea off of *Romney*, it might be discover'd; but then the Distance was great: At all other parts of the Coast, the Sight of it from Sea is hinder'd by Hills, or high Cliffs.

Setting aside the want of a navigable River, the Spot of Ground where this old Town stood, yields to none in the County for Importance and Pleasure: For here, like a Wedge, ends the firm Soil of the *Downs*; Nature has shap'd it like an Equilateral Triangle, having each side half a Mile in Length: Towards the Sea, on the Southern side, 'tis fenc'd by a low Cliff, of 12, 15, and in some Places 20 Foot high (in which Cliff is now to be seen a strong Foundation, that has acute Angles, which shews it to have been for a Fort rather than a Dwelling-House.) On the Northern side is a Morass, with a large Rivulet of very good Water. Between the West side and the *Downs* lies a small Valley, by which Advantage, there was formerly a Harbour, capable of a small Fleet; the Banks on each side of it are an Evidence it was sunk by Industry; but by Weeds and Gravel from the Sea, and by Mould annually added, as is observable<sup>s</sup> in Valleys, it is now so rais'd, that 'tis never flow'd but at high Spring-Tydes, when a strong Wind forceth the Waves into it. This Harbour must have been a good Security to part of the West side; what other Works might have been to guard it, from the end of the Harbour to the Morass, cannot be said; by reason the Ground between has for many Ages been in Tillage. It is easy to imagine of what Importance a Town fortified as this Place must have been in those Ages, when the only Pass by Land from the West to the East End of the County was through it; for other there could not be, in many Miles North; unless the Lands in that Tract, which are still very lowzy and tender, had been well drain'd.

As the Situation describ'd render'd this Place strong, it is very pleasant withal; for the Ground is high enough for a good Prospect of the Low Lands adjoining, and the Country towards *Battell*; besides, it has a com-

<sup>r</sup> Pancirol. Comm. in Notit. Imp. Cap. xc. pag. 179, 180. <sup>s</sup> Philos. Transact. An. 1701. N<sup>o</sup> 274. Pag. 926.



manding view over that Bay, which is between *Beachy-Head* and *Flastings*. If the Use made of it by the *Romans* was to guard the Coast, there was this Advantage belonging to it; that a Centinel on the top of *Beachy*, not Two Miles from it, in a clear Day, without turning his Body, might see the *Isle of Wight*, the Hills in *France* near *Bologn*, and the *Nefs* in *Kent*; so that from the *Nefs* to *Selfey*, it must have been a small Sail that could escape his Eye.

XXI. In the Parish of *Elmbam*, about half a Mile from the Town (or better) there is a Close called the *Broom-close*, lying on the West-side of the Road from *Elmbam* to *Beetly*, and belongs to Mr. *Harvey* of *Buckenham*. About *Candlemass* last some Labourers accidentally pitch'd upon a Pot, in which finding nothing but Dust and Ashes, they went to their Work again, and digging on found two or three more, but the Contents the same. When they came home at Night, they publish'd what they had found, and in a little time were inform'd that they were Urns: The Report of which put some Persons of more Curiosity upon a further Search; and digging first under the Hedge, and afterward further into the Close, found great quantities of them, and several very near together. There is one Man in the Parish who has been chiefly employed in this Search for several People, and the Number that has been taken up since the first Discovery, falls short very little of 120. and yet the compass of Ground turn'd up on this Occasion does not amount to more than a Rood of Land (*i. e.* one quarter of an Acre.) The Close where they are found is high Land, and this Place the highest part of it; the Soil a sharp Gravel, and very dry, and lies next to a Highway. As for the Urns themselves, they are generally of the same Shape, but of very different Sizes. The Shape of these is conformable to the Representations usually exhibited in the Descriptions of Urns; *viz.* the Bottom narrow, a little flatted (and in some quite round) wider upward; the Top contracted to a narrow Mouth: The Earth coarse, the Work rough and uneven, but generally well burnt: some of them slightly wrought and indented (the Work expresses very little Skill or Care) and some plain, of which last sort I have one perfectly entire (not yet open'd.) The Size is various; some of the Capacity of a Quart, some two, some three Quarts, and one I have (unopen'd yet) that I believe will contain a Gallon.

The Pots are very tender when they come first out of the Ground, and frequently suffer by the Wounds of the Spade: They are most of them broken (more or less) in taking them up, and hardly any that have not their Mouths broken; of which many of them seem to be done, as they lie in the Ground, by the weight of the Earth pressing upon them, or the Feet of Horses going over them, as appears by the broken pieces of several of them found a good way down among the Earth. The Urns are found at uncertain Depths; some very near the Surface, some two, some three Spits deep, which is the deepest any Body has taken Pains to dig hitherto.

As for the Contents (by what I can hear) they are generally the same. I have open'd several of them, and found in all of them plenty of pieces



of broken Bones, some Black with burning, and some turn'd to Ashes, with some pieces of coarse Glass run and sticking to the Bones; which whether it proceeded from any thing of that kind burnt with the Body, or only the sandy Earth vitrified with the strength of the Fire (as I am inclined to think) is doubtful. Besides, I found some pieces of Brass, some run, some much burnt, and some not injur'd, with some pieces of Iron, but so decay'd with rust, that their Figure or Use is hard to judge of. I have some Knives and other odd things, but much eaten and decay'd with Rust: But the Brass, which is not burnt to pieces, remains generally firm and entire. One thing is remarkable, we find a great many pair of small Nippers (such as we pull out Hairs with) commonly of Brass; and most of them so perfect and good, that the Edges are full square, and the Spring as strong as any we can make of the Metal. These are chiefly the particulars of what we find: But as for Coins we meet with none. I hear of two in the Hands of a Person of *Elmham*, but had not an opportunity of examining them: But when they were found or taken up I can't tell. I have one found t'other Day in an Urn, but very imperfect; what remains of the Impression looks more like *British* than *Roman*; but by the shape of the Coin and Mettle it should be the latter, tho' I think not easie to determine.

Two of these Urns, of different sizes, with pieces of Bones, Ashes, Teeth, and part of an old Brass Instrument (supposed to have been a *Roman Fibula*) contained in them, are in the *Royal Society's* Repository.

Urns and Sepulchral Monuments found in Ireland, by Fra. Nevill, Esq; n. 337. p. 252.

XXII. At *Castledoe*, I met a Man who had found an Urn within a Mile of that Place. He carried me into a little Island, surrounded with Bogs where his Cabin stood. The Island was very dry, light, sandy Ground, which he had plow'd: The Plough running in some places over flat Stone, cover'd above with Earth, made the Man curious to search: In taking up the Stone he found a Cavity under it, which I believe may be call'd a Sepulcher, or Tomb: In it he found an Urn, which he broke, because nothing was in it but Bones and Ashes. In the same Tomb there were some Bones of one about ten or twelve Years old. The Tomb stood East and West, the Urn was found in the West end; it was the smallest Urn I have seen, but the Cavity wherein it lay was near five Foot long, two Foot and a half broad, and about the same depth: It was made up of six coarse flag Stones, viz. one on each side, one at the Head, another at the Foot, one above and one below: The Bones were much wasted, and but few of them. Whilst I staid there, we opened three more, which the Man quickly found out, because he had made his Marks by the Plough. These three were much larger than the former; one of the three was near the Center of the Island, and biggest of all; but all alike made. There was no Urn in either of them, and but Bones in one, which was the biggest. The Bones seem'd to be of a Man of an ordinary Stature: If there had been any in the other two they were consumed. This seem'd to be a common Burying Place, there being so many of that kind of Tombs in it; and one may gather from thence, that at that time they burnt some, and others they did not; because here



was an Urn found with Bones burnt, and there were Bones unburnt. This Island is situate on an *Isthmus* about half a Mile over, between the Bay of *Dunfannaghan* and the Lough of *Kinnevier*, near to Lieutenant General *Hamilton's* House.

There were three the like Urns found in three small Stone Chests, under a great Kern, or heap of Stones, near to *Ban* Bridge in the County of *Downe*; which heap being removed to help to build that Bridge, they were discover'd. There were the like Urns found near *Omagh* in the County of *Tyrone*, in the like Chests, under two heaps of Stones, which were removed to build some Houses in the said Town. There was one Urn found in a little sandy Hill near *Cookston* on the Road to *Liffon* in the County of *Tyrone*: It was covered with a great rude Lime-Stone; which being removed in order to make Lime, the Urn was discovered in a Hole encompass'd with six Stones of equal bigness, which made a Hexagon, in which the Urn stood. The Water that had fallen on the Urn from the Lime-Stone, or the Air condensing, had petrified, and made a stony Crust on the outside thereof. There were some Bones and Ashes found in it. Sir *Robert Staples* had the Urn and gave it to me, which I designed for the College; but the Fellow I intrusted to carry it broke the same, and so my design fail'd.

At *Dungannon* in the same County, a Servant of mine working in a Sand-Pit near the Town, struck on an Urn, which was the largest I ever saw. It was found with the Mouth whelm'd downward, the Bones and Ashes on a flat Stone, and the Urn covering them: It would have held about three Quarts, and had been better burnt in the Fire than they usually are: But this met with the Fate of others; it was broke by the Spade before the Man was aware, and had no Stones about it as the others; but was bury'd in the Earth about a Foot under Ground. As they dug the Bank for Sand, the Place where the Carcass was burnt was discovered by the Coals and pieces of Bones, which spread a great way, about a Foot under Ground.

Near to the same Town, in a Town-land call'd *Killimeille* (which in *English* is Lowsey Cell, or Lowsey Burying-Place) there are on the top of the Hill two Circles of dry Stone about 20 Yards in Diameter each; they meet on two sides and make the Figure of Eight. I suppose when first form'd they made a dry Wall for two distinct Burying-Places, one for the Men, the other for the Women; or rather two Repositories for Urns. One *James Hamilton*, who farm'd the Ground from Mr. *Knox*, wanting Stones to build a House, drew off most of them from this Place. When he had enter'd within one of the Circles, he found three Urns in three several Holes, set about with six Stones, and cover'd with flat Stones, and other Stones thrown on the Top; he broke what he found, not finding what he expected. Mr. *Knox* and I went there to see the Place, and saw the Holes and broken Urns; but the Man's House being finish'd there were no more found; but I am perswaded there are many more, because these three were found near together. The Poor Man met with an Accident of Fire in his Malt-House, which did him great Damage; the *Irish* attributed it to his taking those



Stones to build his House, which they call'd Holy, tho they knew nothing of its being a Burying Place till thus discover'd. On the same Hill about thirty Yards distance to the Eastward of these Circles, upon search we found the Altar whereon they used to burn the Dead, over-grown with Earth and green Sod, which we caused to be uncovered: It was made of dry Stone, eight Foot long and four Foot broad, the Coals and Bones fresh among the Stones, and the Stones burnt with Fire. At the East end of this Altar there was a Pit, which was likewise over-grown with Earth and green Sod; which we open'd, and found it to be the Receiver, where they swept in all that remain'd on the Altar after Burning. We search'd deep, and the substance was all alike, black and greasy: It had tinged the Hill in a strait Line from the Pit to the bottom of the Hill; and discover'd it self to our View, the Land being then plough'd.

In the County of *Farmannagh*, upon a Hill over *Wattle-Bridge*, there has been a mighty Heap of Stones, the Basis incircled with very large Stones standing on end. This Heap has been removed to pave our Ways, and build that Bridge; under which there were some Urns found in Stone-Coffins, and I believe there are some remaining. These were, I suppose, the Urns of some great Personages. The Heap was so big, and the Stones about it so large and so many, that it cost great Pains to bring them there: Or perhaps there might have been a Fight there, and some of the great Officers might have their Bones interr'd there, and the Army made that great Work over them; for it seem'd to be a Work done by many. I have seen several such Heaps in this Kingdom, and I doubt not but they are all Monuments for the Dead.

*Ancient  
Trumpets, &c.  
found in Ire-  
land, by the  
same. ib. p.  
270.  
Plate 8. B.*

XXIII. There were 8 Trumpets, 4 of one Make, and 4 of another, found in the lower Barony of Dungannon, about 7 Years ago. Two I have now by me, represented in Fig. 4. and 5. They are of cast Brass, about the Thickness of an *English* Half-Crown.

Fig. 4. is 24 Inches long, according to the Turn or Arch it makes, and is 3 Inches in Diameter at the large end, and at the small end it is solid for about 2 Inches, with a Loop at top to hang it by, and another Loop between the solid part and the Mouth-piece. The Mouth-piece is oval 5 Inches from the solid end, 1 Inch and  $\frac{3}{4}$  long, and 1 Inch wide: The Sides are smooth, round, and even, easy for the Lips of a Man, but will not admit of any Sound by Blast as a Horn doth, but by the articulate Voice of tooting it will: One may raise his Voice in it to the highest Pitch, and bring it to the deepest Base.

Fig. 5. is 26 Inches long, one Inch wide at the small end, and three Inches at the other; but seems to be imperfect for want of a Mouth-piece; the small end seems to be fitted to receive one. On the Back at *a*, there is a Hole, and another under the Moulding at *b*; the first I believe was to fasten the Mouth-piece, the second I imagine was to stop or open with the Finger to alter the Sound at pleasure. But as it is now, it cannot be sounded; for it is no way fitted for the Mouth, it being thin and sharp.

I can-



𐎠𐎡𐎢𐎣𐎤𐎥𐎦𐎧𐎨𐎩𐎪𐎫𐎬𐎭𐎮𐎯𐎰𐎱𐎲𐎳𐎴𐎵𐎶𐎷𐎸𐎹𐎺𐎻𐎼𐎽𐎾𐎿𐏀𐏁𐏂𐏃𐏄𐏅𐏆𐏇𐏈𐏉𐏊𐏋𐏌𐏍𐏎𐏏𐏐𐏑𐏒𐏓𐏔𐏕𐏖𐏗𐏘𐏙𐏚𐏛𐏜𐏝𐏞𐏟𐏠𐏡𐏢𐏣𐏤𐏥𐏦𐏧𐏨𐏩𐏪𐏫𐏬𐏭𐏮𐏯𐏰𐏱𐏲𐏳𐏴𐏵𐏶𐏷𐏸𐏹𐏺𐏻𐏼𐏽𐏾𐏿𐐀𐐁𐐂𐐃𐐄𐐅𐐆𐐇𐐈𐐉𐐊𐐋𐐌𐐍𐐎𐐏𐐐𐐑𐐒𐐓𐐔𐐕𐐖𐐗𐐘𐐙𐐚𐐛𐐜𐐝𐐞𐐟𐐠𐐡𐐢𐐣𐐤𐐥𐐦𐐧𐐨𐐩𐐪𐐫𐐬𐐭𐐮𐐯𐐰𐐱𐐲𐐳𐐴𐐵𐐶𐐷𐐸𐐹𐐺𐐻𐐼𐐽𐐾𐐿𐑀𐑁𐑂𐑃𐑄𐑅𐑆𐑇𐑈𐑉𐑊𐑋𐑌𐑍𐑎𐑏𐑐𐑑𐑒𐑓𐑔𐑕𐑖𐑗𐑘𐑙𐑚𐑛𐑜𐑝𐑞𐑟𐑠𐑡𐑢𐑣𐑤𐑥𐑦𐑧𐑨𐑩𐑪𐑫𐑬𐑭𐑮𐑯𐑰𐑱𐑲𐑳𐑴𐑵𐑶𐑷𐑸𐑹𐑺𐑻𐑼𐑽𐑾𐑿𐒀𐒁𐒂𐒃𐒄𐒅𐒆𐒇𐒈𐒉𐒊𐒋𐒌𐒍𐒎𐒏𐒐𐒑𐒒𐒓𐒔𐒕𐒖𐒗𐒘𐒙𐒚𐒛𐒜𐒝𐒞𐒟𐒠𐒡𐒢𐒣𐒤𐒥𐒦𐒧𐒨𐒩𐒪𐒫𐒬𐒭𐒮𐒯𐒰𐒱𐒲𐒳𐒴𐒵𐒶𐒷𐒸𐒹𐒺𐒻𐒼𐒽𐒾𐒿𐓀𐓁𐓂𐓃𐓄𐓅𐓆𐓇𐓈𐓉𐓊𐓋𐓌𐓍𐓎𐓏𐓐𐓑𐓒𐓓𐓔𐓕𐓖𐓗𐓘𐓙𐓚𐓛𐓜𐓝𐓞𐓟𐓠𐓡𐓢𐓣𐓤𐓥𐓦𐓧𐓨𐓩𐓪𐓫𐓬𐓭𐓮𐓯𐓰𐓱𐓲𐓳𐓴𐓵𐓶𐓷𐓸𐓹𐓺𐓻𐓼𐓽𐓾𐓿𐔀𐔁𐔂𐔃𐔄𐔅𐔆𐔇𐔈𐔉𐔊𐔋𐔌𐔍𐔎𐔏𐔐𐔑𐔒𐔓𐔔𐔕𐔖𐔗𐔘𐔙𐔚𐔛𐔜𐔝𐔞𐔟𐔠𐔡𐔢𐔣𐔤𐔥𐔦𐔧𐔨𐔩𐔪𐔫𐔬𐔭𐔮𐔯𐔰𐔱𐔲𐔳𐔴𐔵𐔶𐔷𐔸𐔹𐔺𐔻𐔼𐔽𐔾𐔿𐕀𐕁𐕂𐕃𐕄𐕅𐕆𐕇𐕈𐕉𐕊𐕋𐕌𐕍𐕎𐕏𐕐𐕑𐕒𐕓𐕔𐕕𐕖𐕗𐕘𐕙𐕚𐕛𐕜𐕝𐕞𐕟𐕠𐕡𐕢𐕣𐕤𐕥𐕦𐕧𐕨𐕩𐕪𐕫𐕬𐕭𐕮𐕯𐕰𐕱𐕲𐕳𐕴𐕵𐕶𐕷𐕸𐕹𐕺𐕻𐕼𐕽𐕾𐕿𐖀𐖁𐖂𐖃𐖄𐖅𐖆𐖇𐖈𐖉𐖊𐖋𐖌𐖍𐖎𐖏𐖐𐖑𐖒𐖓𐖔𐖕𐖖𐖗𐖘𐖙𐖚𐖛𐖜𐖝𐖞𐖟𐖠𐖡𐖢𐖣𐖤𐖥𐖦𐖧𐖨𐖩𐖪𐖫𐖬𐖭𐖮𐖯𐖰𐖱𐖲𐖳𐖴𐖵𐖶𐖷𐖸𐖹𐖺𐖻𐖼𐖽𐖾𐖿𐗀𐗁𐗂𐗃𐗄𐗅𐗆𐗇𐗈𐗉𐗊𐗋𐗌𐗍𐗎𐗏𐗐𐗑𐗒𐗓𐗔𐗕𐗖𐗗𐗘𐗙𐗚𐗛𐗜𐗝𐗞𐗟𐗠𐗡𐗢𐗣𐗤𐗥𐗦𐗧𐗨𐗩𐗪𐗫𐗬𐗭𐗮𐗯𐗰𐗱𐗲𐗳𐗴𐗵𐗶𐗷𐗸𐗹𐗺𐗻𐗼𐗽𐗾𐗿𐘀𐘁𐘂𐘃𐘄𐘅𐘆𐘇𐘈𐘉𐘊𐘋𐘌𐘍𐘎𐘏𐘐𐘑𐘒𐘓𐘔𐘕𐘖𐘗𐘘𐘙𐘚𐘛𐘜𐘝𐘞𐘟𐘠𐘡𐘢𐘣𐘤𐘥𐘦𐘧𐘨𐘩𐘪𐘫𐘬𐘭𐘮𐘯𐘰𐘱𐘲𐘳𐘴𐘵𐘶𐘷𐘸𐘹𐘺𐘻𐘼𐘽𐘾𐘿𐙀𐙁𐙂𐙃𐙄𐙅𐙆𐙇𐙈𐙉𐙊𐙋𐙌𐙍𐙎𐙏𐙐𐙑𐙒𐙓𐙔𐙕𐙖𐙗𐙘𐙙𐙚𐙛𐙜𐙝𐙞𐙟𐙠𐙡𐙢𐙣𐙤𐙥𐙦𐙧𐙨𐙩𐙪𐙫𐙬𐙭𐙮𐙯𐙰𐙱𐙲𐙳𐙴𐙵𐙶𐙷𐙸𐙹𐙺𐙻𐙼𐙽𐙾𐙿𐚀𐚁𐚂𐚃𐚄𐚅𐚆𐚇𐚈𐚉𐚊𐚋𐚌𐚍𐚎𐚏𐚐𐚑𐚒𐚓𐚔𐚕𐚖𐚗𐚘𐚙𐚚𐚛𐚜𐚝𐚞𐚟𐚠𐚡𐚢𐚣𐚤𐚥𐚦𐚧𐚨𐚩𐚪𐚫𐚬𐚭𐚮𐚯𐚰𐚱𐚲𐚳𐚴𐚵𐚶𐚷𐚸𐚹𐚺𐚻𐚼𐚽𐚾𐚿𐛀𐛁𐛂𐛃𐛄𐛅𐛆𐛇𐛈𐛉𐛊𐛋𐛌𐛍𐛎𐛏𐛐𐛑𐛒𐛓𐛔𐛕𐛖𐛗𐛘𐛙𐛚𐛛𐛜𐛝𐛞𐛟𐛠𐛡𐛢𐛣𐛤𐛥𐛦𐛧𐛨𐛩𐛪𐛫𐛬𐛭𐛮𐛯𐛰𐛱𐛲𐛳𐛴𐛵𐛶𐛷𐛸𐛹𐛺𐛻𐛼𐛽𐛾𐛿𐜀𐜁𐜂𐜃𐜄𐜅𐜆𐜇𐜈𐜉𐜊𐜋𐜌𐜍𐜎𐜏𐜐𐜑𐜒𐜓𐜔𐜕𐜖𐜗𐜘𐜙𐜚𐜛𐜜𐜝𐜞𐜟𐜠𐜡𐜢𐜣𐜤𐜥𐜦𐜧𐜨𐜩𐜪𐜫𐜬𐜭𐜮𐜯𐜰𐜱𐜲𐜳𐜴𐜵𐜶𐜷𐜸𐜹𐜺𐜻𐜼𐜽𐜾𐜿𐝀𐝁𐝂𐝃𐝄𐝅𐝆𐝇𐝈𐝉𐝊𐝋𐝌𐝍𐝎𐝏𐝐𐝑𐝒𐝓𐝔𐝕𐝖𐝗𐝘𐝙𐝚𐝛𐝜𐝝𐝞𐝟𐝠𐝡𐝢𐝣𐝤𐝥𐝦𐝧𐝨𐝩𐝪𐝫𐝬𐝭𐝮𐝯𐝰𐝱𐝲𐝳𐝴𐝵𐝶𐝷𐝸𐝹𐝺𐝻𐝼𐝽𐝾𐝿𐞀𐞁𐞂𐞃𐞄𐞅𐞆𐞇𐞈𐞉𐞊𐞋𐞌𐞍𐞎𐞏𐞐𐞑𐞒𐞓𐞔𐞕𐞖𐞗𐞘𐞙𐞚𐞛𐞜𐞝𐞞𐞟𐞠𐞡𐞢𐞣𐞤𐞥𐞦𐞧𐞨𐞩𐞪𐞫𐞬𐞭𐞮𐞯𐞰𐞱𐞲𐞳𐞴𐞵𐞶𐞷𐞸𐞹𐞺𐞻𐞼𐞽𐞾𐞿𐟀𐟁𐟂𐟃𐟄𐟅𐟆𐟇𐟈𐟉𐟊𐟋𐟌𐟍𐟎𐟏𐟐𐟑𐟒𐟓𐟔𐟕𐟖𐟗𐟘𐟙𐟚𐟛𐟜𐟝𐟞𐟟𐟠𐟡𐟢𐟣𐟤𐟥𐟦𐟧𐟨𐟩𐟪𐟫𐟬𐟭𐟮𐟯𐟰𐟱𐟲𐟳𐟴𐟵𐟶𐟷𐟸𐟹𐟺𐟻𐟼𐟽𐟾𐟿𐠀𐠁𐠂𐠃𐠄𐠅𐠆𐠇𐠈𐠉𐠊𐠋𐠌𐠍𐠎𐠏𐠐𐠑𐠒𐠓𐠔𐠕𐠖𐠗𐠘𐠙𐠚𐠛𐠜𐠝𐠞𐠟𐠠𐠡𐠢𐠣𐠤𐠥𐠦𐠧𐠨𐠩𐠪𐠫𐠬𐠭𐠮𐠯𐠰𐠱𐠲𐠳𐠴𐠵𐠶𐠷𐠸𐠹𐠺𐠻𐠼𐠽𐠾𐠿𐡀𐡁𐡂𐡃𐡄𐡅𐡆𐡇𐡈𐡉𐡊𐡋𐡌𐡍𐡎𐡏𐡐𐡑𐡒𐡓𐡔𐡕𐡖𐡗𐡘𐡙𐡚𐡛𐡜𐡝𐡞𐡟𐡠𐡡𐡢𐡣𐡤𐡥𐡦𐡧𐡨𐡩𐡪𐡫𐡬𐡭𐡮𐡯𐡰𐡱𐡲𐡳𐡴𐡵𐡶𐡷𐡸𐡹𐡺𐡻𐡼𐡽𐡾𐡿𐢀𐢁𐢂𐢃𐢄𐢅𐢆𐢇𐢈𐢉𐢊𐢋𐢌𐢍𐢎𐢏𐢐𐢑𐢒𐢓𐢔𐢕𐢖𐢗𐢘𐢙𐢚𐢛𐢜𐢝𐢞𐢟𐢠𐢡𐢢𐢣𐢤𐢥𐢦𐢧𐢨𐢩𐢪𐢫𐢬𐢭𐢮𐢯𐢰𐢱𐢲𐢳𐢴𐢵𐢶𐢷𐢸𐢹𐢺𐢻𐢼𐢽𐢾𐢿𐣀𐣁𐣂𐣃𐣄𐣅𐣆𐣇𐣈𐣉𐣊𐣋𐣌𐣍𐣎𐣏𐣐𐣑𐣒𐣓𐣔𐣕𐣖𐣗𐣘𐣙𐣚𐣛𐣜𐣝𐣞𐣟𐣠𐣡𐣢𐣣𐣤𐣥𐣦𐣧𐣨𐣩𐣪𐣫𐣬𐣭𐣮𐣯𐣰𐣱𐣲𐣳𐣴𐣵𐣶𐣷𐣸𐣹𐣺𐣻𐣼𐣽𐣾𐣿𐤀𐤁𐤂𐤃𐤄𐤅𐤆𐤇𐤈𐤉𐤊𐤋𐤌𐤍𐤎𐤏𐤐𐤑𐤒𐤓𐤔𐤕𐤖𐤗𐤘𐤙𐤚𐤛𐤜𐤝𐤞𐤟𐤠𐤡𐤢𐤣𐤤𐤥𐤦𐤧𐤨𐤩𐤪𐤫𐤬𐤭𐤮𐤯𐤰𐤱𐤲𐤳𐤴𐤵𐤶𐤷𐤸𐤹𐤺𐤻𐤼𐤽𐤾𐤿𐥀𐥁𐥂𐥃𐥄𐥅𐥆𐥇𐥈𐥉𐥊𐥋𐥌𐥍𐥎𐥏𐥐𐥑𐥒𐥓𐥔𐥕𐥖𐥗𐥘𐥙𐥚𐥛𐥜𐥝𐥞𐥟𐥠𐥡𐥢𐥣𐥤𐥥𐥦𐥧𐥨𐥩𐥪𐥫𐥬𐥭𐥮𐥯𐥰𐥱𐥲𐥳𐥴𐥵𐥶𐥷𐥸𐥹𐥺𐥻𐥼𐥽𐥾𐥿𐦀𐦁𐦂𐦃𐦄𐦅𐦆𐦇𐦈𐦉𐦊𐦋𐦌𐦍𐦎𐦏𐦐𐦑𐦒𐦓𐦔𐦕𐦖𐦗𐦘𐦙𐦚𐦛𐦜𐦝𐦞𐦟𐦠𐦡𐦢𐦣𐦤𐦥𐦦𐦧𐦨𐦩𐦪𐦫𐦬𐦭𐦮𐦯𐦰𐦱𐦲𐦳𐦴𐦵𐦶𐦷𐦸𐦹𐦺𐦻𐦼𐦽𐦾𐦿𐧀𐧁𐧂𐧃𐧄𐧅𐧆𐧇𐧈𐧉𐧊𐧋𐧌𐧍𐧎𐧏𐧐𐧑𐧒𐧓𐧔𐧕𐧖𐧗𐧘𐧙𐧚𐧛𐧜𐧝𐧞𐧟𐧠𐧡𐧢𐧣𐧤𐧥𐧦𐧧𐧨𐧩𐧪𐧫𐧬𐧭𐧮𐧯𐧰𐧱𐧲𐧳𐧴𐧵𐧶𐧷𐧸𐧹𐧺𐧻𐧼𐧽𐧾𐧿𐨀𐨁𐨂𐨃𐨄𐨅𐨆𐨇𐨈𐨉𐨊𐨋𐨌𐨍𐨎𐨏𐨐𐨑𐨒𐨓𐨔𐨕𐨖𐨗𐨘𐨙𐨚𐨛𐨜𐨝𐨞𐨟𐨠𐨡𐨢𐨣𐨤𐨥𐨦𐨧𐨨𐨩𐨪𐨫𐨬𐨭𐨮𐨯𐨰𐨱𐨲𐨳𐨴𐨵𐨶𐨷𐨹𐨺𐨸𐨻𐨼𐨽𐨾𐨿𐩀𐩁𐩂𐩃𐩄𐩅𐩆𐩇𐩈𐩉𐩊𐩋𐩌𐩍𐩎𐩏𐩐𐩑𐩒𐩓𐩔𐩕𐩖𐩗𐩘𐩙𐩚𐩛𐩜𐩝𐩞𐩟𐩠𐩡𐩢𐩣𐩤𐩥𐩦𐩧𐩨𐩩𐩪𐩫𐩬𐩭𐩮𐩯𐩰𐩱𐩲𐩳𐩴𐩵𐩶𐩷𐩸𐩹𐩺𐩻𐩼𐩽𐩾𐩿𐪀𐪁𐪂𐪃𐪄𐪅𐪆𐪇𐪈𐪉𐪊𐪋𐪌𐪍𐪎𐪏𐪐𐪑𐪒𐪓𐪔𐪕𐪖𐪗𐪘𐪙𐪚𐪛𐪜𐪝𐪞𐪟𐪠𐪡𐪢𐪣𐪤𐪥𐪦𐪧𐪨𐪩𐪪𐪫𐪬𐪭𐪮𐪯𐪰𐪱𐪲𐪳𐪴𐪵𐪶𐪷𐪸𐪹𐪺𐪻𐪼𐪽𐪾𐪿𐫀𐫁𐫂𐫃𐫄𐫅𐫆𐫇𐫈𐫉𐫊𐫋𐫌𐫍𐫎𐫏𐫐𐫑𐫒𐫓𐫔𐫕𐫖𐫗𐫘𐫙𐫚𐫛𐫜𐫝𐫞𐫟𐫠𐫡𐫢𐫣𐫤𐫦𐫥𐫧𐫨𐫩𐫪𐫫𐫬𐫭𐫮𐫯𐫰𐫱𐫲𐫳𐫴𐫵𐫶𐫷𐫸𐫹𐫺𐫻𐫼𐫽𐫾𐫿𐬀𐬁𐬂𐬃𐬄𐬅𐬆𐬇𐬈𐬉𐬊𐬋𐬌𐬍𐬎𐬏𐬐𐬑𐬒𐬓𐬔𐬕𐬖𐬗𐬘𐬙𐬚𐬛𐬜𐬝𐬞𐬟𐬠𐬡𐬢𐬣𐬤𐬥𐬦𐬧𐬨𐬩𐬪𐬫𐬬𐬭𐬮𐬯𐬰𐬱𐬲𐬳𐬴𐬵𐬶𐬷𐬸𐬹𐬺𐬻𐬼𐬽𐬾𐬿𐭀𐭁𐭂𐭃𐭄𐭅𐭆𐭇𐭈𐭉𐭊𐭋𐭌𐭍𐭎𐭏𐭐𐭑𐭒𐭓𐭔𐭕𐭖𐭗𐭘𐭙𐭚𐭛𐭜𐭝𐭞𐭟𐭠𐭡𐭢𐭣𐭤𐭥𐭦𐭧𐭨𐭩𐭪𐭫𐭬𐭭𐭮𐭯𐭰𐭱𐭲𐭳𐭴𐭵𐭶𐭷𐭸𐭹𐭺𐭻𐭼𐭽𐭾𐭿𐮀𐮁𐮂𐮃𐮄𐮅𐮆𐮇𐮈𐮉𐮊𐮋𐮌𐮍𐮎𐮏𐮐𐮑𐮒𐮓𐮔𐮕𐮖𐮗𐮘𐮙𐮚𐮛𐮜𐮝𐮞𐮟𐮠𐮡𐮢𐮣𐮤𐮥𐮦𐮧𐮨𐮩𐮪𐮫𐮬𐮭𐮮𐮯𐮰𐮱𐮲𐮳𐮴𐮵𐮶𐮷𐮸𐮹𐮺𐮻𐮼𐮽𐮾𐮿𐯀𐯁𐯂𐯃𐯄𐯅𐯆𐯇𐯈𐯉𐯊𐯋𐯌𐯍𐯎𐯏𐯐𐯑𐯒𐯓𐯔𐯕𐯖𐯗𐯘𐯙𐯚𐯛𐯜𐯝𐯞𐯟𐯠𐯡𐯢𐯣𐯤𐯥𐯦𐯧𐯨𐯩𐯪𐯫𐯬𐯭𐯮𐯯𐯰𐯱𐯲𐯳𐯴𐯵𐯶𐯷𐯸𐯹𐯺𐯻𐯼𐯽𐯾𐯿𐰀𐰁𐰂𐰃𐰄𐰅𐰆𐰇𐰈𐰉𐰊𐰋𐰌𐰍𐰎𐰏𐰐𐰑𐰒𐰓𐰔𐰕𐰖𐰗𐰘𐰙𐰚𐰛𐰜𐰝𐰞𐰟𐰠𐰡𐰢𐰣𐰤𐰥𐰦𐰧𐰨𐰩𐰪𐰫𐰬𐰭𐰮𐰯𐰰𐰱𐰲𐰳𐰴𐰵𐰶𐰷𐰸𐰹𐰺𐰻𐰼𐰽𐰾𐰿𐱀𐱁𐱂𐱃𐱄𐱅𐱆𐱇𐱈𐱉𐱊𐱋𐱌𐱍𐱎𐱏𐱐𐱑𐱒𐱓𐱔𐱕𐱖𐱗𐱘𐱙𐱚𐱛𐱜𐱝𐱞𐱟𐱠𐱡𐱢𐱣𐱤𐱥𐱦𐱧𐱨𐱩𐱪𐱫𐱬𐱭𐱮𐱯𐱰𐱱𐱲𐱳𐱴𐱵𐱶𐱷𐱸𐱹𐱺𐱻𐱼𐱽𐱾𐱿𐲀𐲁𐲂𐲃𐲄𐲅𐲆𐲇𐲈𐲉𐲊𐲋𐲌𐲍𐲎𐲏𐲐𐲑𐲒𐲓𐲔𐲕𐲖𐲗𐲘𐲙𐲚𐲛𐲜𐲝𐲞𐲟𐲠𐲡𐲢𐲣𐲤𐲥𐲦𐲧𐲨𐲩𐲪𐲫𐲬𐲭𐲮𐲯𐲰𐲱𐲲𐲳𐲴𐲵𐲶𐲷𐲸𐲹𐲺𐲻𐲼𐲽𐲾𐲿𐳀𐳁𐳂𐳃𐳄𐳅𐳆𐳇𐳈𐳉𐳊𐳋𐳌𐳍𐳎𐳏𐳐𐳑𐳒𐳓𐳔𐳕𐳖𐳗𐳘𐳙𐳚𐳛𐳜𐳝𐳞𐳟𐳠𐳡𐳢𐳣𐳤𐳥𐳦𐳧𐳨𐳩𐳪𐳫𐳬𐳭𐳮𐳯𐳰𐳱𐳲𐳳𐳴𐳵𐳶𐳷𐳸𐳹𐳺𐳻𐳼𐳽𐳾𐳿𐴀𐴁𐴂𐴃𐴄𐴅𐴆𐴇𐴈𐴉𐴊𐴋𐴌𐴍𐴎𐴏𐴐𐴑𐴒𐴓𐴔𐴕𐴖𐴗𐴘𐴙𐴚𐴛𐴜𐴝𐴞𐴟𐴠𐴡𐴢𐴣𐴤𐴥𐴦𐴧𐴨𐴩𐴪𐴫𐴬𐴭𐴮𐴯𐴰𐴱𐴲𐴳𐴴𐴵𐴶𐴷𐴸𐴹𐴺𐴻𐴼𐴽𐴾𐴿𐵀𐵁𐵂𐵃𐵄𐵅𐵆𐵇𐵈𐵉𐵊𐵋𐵌𐵍𐵎𐵏𐵐𐵑𐵒𐵓𐵔𐵕𐵖𐵗𐵘𐵙𐵚𐵛𐵜𐵝𐵞𐵟𐵠𐵡𐵢𐵣𐵤𐵥𐵦𐵧𐵨𐵩𐵪𐵫𐵬𐵭𐵮𐵯𐵰𐵱𐵲𐵳𐵴𐵵𐵶𐵷𐵸𐵹𐵺𐵻𐵼𐵽𐵾𐵿𐶀𐶁𐶂𐶃𐶄𐶅𐶆𐶇𐶈𐶉𐶊𐶋𐶌𐶍𐶎𐶏𐶐𐶑𐶒𐶓𐶔𐶕𐶖𐶗𐶘𐶙𐶚𐶛𐶜𐶝𐶞𐶟𐶠𐶡𐶢𐶣𐶤𐶥𐶦𐶧𐶨𐶩𐶪𐶫𐶬𐶭𐶮𐶯𐶰𐶱𐶲𐶳𐶴𐶵𐶶𐶷𐶸𐶹𐶺𐶻𐶼𐶽𐶾𐶿𐷀𐷁𐷂𐷃𐷄𐷅𐷆𐷇𐷈𐷉𐷊𐷋𐷌𐷍𐷎𐷏𐷐𐷑𐷒𐷓𐷔𐷕𐷖𐷗𐷘𐷙𐷚𐷛𐷜𐷝𐷞𐷟𐷠𐷡𐷢𐷣𐷤𐷥𐷦𐷧𐷨𐷩𐷪𐷫𐷬𐷭𐷮𐷯𐷰𐷱𐷲𐷳𐷴𐷵𐷶𐷷𐷸𐷹𐷺𐷻𐷼𐷽𐷾𐷿𐸀𐸁𐸂𐸃𐸄𐸅𐸆𐸇𐸈𐸉𐸊𐸋𐸌𐸍𐸎𐸏𐸐𐸑𐸒𐸓𐸔𐸕𐸖𐸗𐸘𐸙𐸚𐸛𐸜𐸝𐸞𐸟𐸠𐸡𐸢𐸣𐸤𐸥𐸦𐸧𐸨𐸩𐸪𐸫𐸬𐸭𐸮𐸯𐸰𐸱𐸲𐸳𐸴𐸵𐸶𐸷𐸸𐸹𐸺𐸻𐸼𐸽𐸾𐸿𐹀𐹁𐹂𐹃𐹄𐹅𐹆𐹇𐹈𐹉𐹊𐹋𐹌𐹍𐹎𐹏𐹐𐹑𐹒𐹓𐹔𐹕𐹖𐹗𐹘𐹙𐹚𐹛𐹜𐹝𐹞𐹟𐹠𐹡𐹢𐹣𐹤𐹥𐹦𐹧𐹨𐹩𐹪𐹫𐹬𐹭𐹮𐹯𐹰𐹱𐹲𐹳𐹴𐹵𐹶𐹷𐹸𐹹𐹺𐹻𐹼𐹽𐹾𐹿𐺀𐺁𐺂𐺃𐺄𐺅𐺆𐺇𐺈𐺉𐺊𐺋𐺌𐺍𐺎𐺏𐺐𐺑𐺒𐺓𐺔𐺕𐺖𐺗𐺘𐺙𐺚𐺛𐺜𐺝𐺞𐺟𐺠𐺡𐺢𐺣𐺤𐺥𐺦𐺧𐺨𐺩𐺪𐺫𐺬𐺭𐺮𐺯𐺰𐺱𐺲𐺳𐺴𐺵𐺶𐺷𐺸𐺹𐺺𐺻𐺼𐺽𐺾𐺿𐻀𐻁𐻂𐻃𐻄𐻅𐻆𐻇𐻈𐻉𐻊𐻋𐻌𐻍𐻎𐻏𐻐𐻑𐻒𐻓𐻔𐻕𐻖𐻗𐻘𐻙𐻚𐻛𐻜𐻝𐻞𐻟𐻠𐻡𐻢𐻣𐻤𐻥𐻦𐻧𐻨𐻩𐻪𐻫𐻬𐻭𐻮𐻯𐻰𐻱𐻲𐻳𐻴𐻵𐻶𐻷𐻸𐻹𐻺𐻻𐻼𐻽𐻾𐻿𐼀𐼁𐼂𐼃𐼄𐼅𐼆𐼇𐼈𐼉𐼊𐼋𐼌𐼍𐼎𐼏𐼐𐼑𐼒𐼓𐼔𐼕𐼖𐼗𐼘𐼙𐼚𐼛𐼜𐼝𐼞𐼟𐼠𐼡𐼢𐼣𐼤𐼥𐼦𐼧𐼨𐼩𐼪𐼫𐼬𐼭𐼮𐼯𐼰𐼱𐼲𐼳𐼴𐼵𐼶𐼷𐼸𐼹𐼺𐼻𐼼𐼽𐼾𐼿𐽀𐽁𐽂𐽃𐽄𐽅𐽆𐽇𐽋𐽍𐽎𐽏𐽐𐽈𐽉𐽊𐽌𐽑𐽒𐽓𐽔𐽕𐽖𐽗𐽘𐽙𐽚𐽛𐽜𐽝𐽞𐽟𐽠𐽡𐽢𐽣𐽤𐽥𐽦𐽧𐽨𐽩𐽪𐽫𐽬𐽭𐽮𐽯𐽰𐽱𐽲𐽳𐽴𐽵𐽶𐽷𐽸𐽹𐽺𐽻𐽼𐽽𐽾𐽿𐾀𐾁𐾃𐾅𐾂𐾄𐾆𐾇𐾈𐾉𐾊𐾋𐾌𐾍𐾎𐾏𐾐𐾑𐾒𐾓𐾔𐾕𐾖𐾗𐾘𐾙𐾚𐾛𐾜𐾝𐾞𐾟𐾠𐾡𐾢𐾣







I cannot find in any *Irish* Story, or by Tradition, any Account of this sort of Trumpets, nor indeed of any other; from whence I gather they are of great Antiquity: For had they been of use at, or since the first of the *English* Conquests, there would have been some hints of them. And therefore I do conclude they were of use when the Country was Pagan, and not in Martial Affairs, but by their Priests at their Funeral Rites when they buried their Dead, and bore a part with those who cry'd at those Funerals, or made an howling sort of a Noise; which sort of Noise is used among the Natives to this Day.

Fig. 6. is an Instrument of much better Metal, being fine Gold; but what to call it, or of what use, I never could meet with any could tell me. There have been 5 found in different places, three of which I have seen since I came to this Place. One was found near *Coot-hill*, in scowring a Ditch, under the side of a large Stone; which Stone was one of three which were placed triangular-wise; whether set in this form as a Mark to find this thing when hid, or whether for any other use, I cannot guess; but I have seen Stones in several Parts of this Kingdom set in this Order. It is reported, that there were some other pieces of Gold found with this, but I could not see them: One, I was told, was somewhat like a Scepter, about eighteen Inches long; and another was round like a large Medal, as thick as two Crown Pieces, and as broad as the Palm of a Man's Hand, with strange Characters on it. But whatever they were, the poor Man that found them I believe got but little by them; for this, of which I have here sent the Draught, was sold at the Market of *Coothill* for a quarter of a Pound of Tobacco, and afterwards at *Dublin* for 23 Pounds, where I saw it at the Goldsmiths. Its Beauty and Colour surpassed any Gold I had seen: It had been cast, and not wrought with the Hammer. The two Cones were two Inches in Diameter each, and two Inches asunder from each other. The Bow or Handle was made like an Arch (as you see in the Figure) about a quarter of an Inch thick: The Handle was round, tapering towards both ends, where it was fixed to both the Cones. The Goldsmith told me, that when he had wrought part thereof, he could not bring the Gold to the right Colour again, tho' it was in fineness equal to our Standard.

XXIV. Fig. 1. The rocky Mountain *Cannara* in the Island of *Salset* belonging to the *Portuguese*, with the Temple and Caverns.

A. The Temple and sacrificing Place, like the Choir of a Church, arch'd and supported by 45 Pillars, all cut out of the Rock.

B. The Altar in the furthest end of it, also cut out of the Rock; with a narrow Canal about the Foot of it, I suppose design'd to be fill'd with Water.

C C. The unknown Characters engraven on the Rock on each side of the square Entry, represented in Fig. 2.

D D D, &c. The various irregular Paths of Ascent, some cut out in Steps, as Stairs.

*The Figures of a Pagan Temple and unknown Characters at Cannara in Salset. n. 321. p. 372, by Mr. Alex. Stuart. Plate 9.*



1 2 3, &c. The various Caverns, mostly of a square Figure, some large, others smaller; cut out of the Rock, whose Roofs are cut plain, like a plaister'd Room: At the Door of each without is a large Cistern or two, cut out of the Rock, full of Rain-water; at least I could not perceive them to be Springs.

On the Sides of the Doors of some of the Caverns are Characters like those of the Temple.

Fig. 2. Characters engraven on each side of the Door or Entry of the Pagan Temple of *Cannara*. See *Phil. Trans.* n. 201. *Abr.* vol. 3. p. 526.

Teeth and  
Bones in Nor-  
thumberland,  
by Dr. Todd.  
n. 330. p. 291.

XXV. The Place where the Bones were found is *Colchester*, a Mile West of *Corbridge*, upon the North Banks of the River *Tyne*: formerly a *Roman* Colony; but, at present, a Field of Corn; nothing of Antiquity remaining, but some Walls and Rubbish; which shew it to have been a very large Fortrefs. Stones, which have been dug up, with Figures and Inscriptions upon them, have been all remov'd to *Corbridge*, which has risen out of its Ruins. There, I saw Altars inscrib'd; One IMP. M. AVRELIO... Another LEG. II. AUG. COH. III. But that which is most remarkable is that which stands in a corner of the Church-yard, Dedicated to *Hercules*, in Old Capital, *Greek* Characters; the like to which, is not to be met with, I think, in any other Part of this Island. The Characters are indifferent plain; and, as I could read them, thus;

ΘΗΡΑΚΛΕΙΣ  
 ΘΤΤΡΙΩΣ  
 ΘΔΕΟΔΩΡΑ  
 ΘΑΡΧΙΕΡΕΑ

i.e. *Herculi Tyrio Divina Dona, Archi-Sacerdotalia, vel, per Summum Sacerdotem offerenda*. The Altar seems to have been erected by some of the *Asiatick Phœnician* Auxiliaries; who might be in Garrison here, near the Frontier, under *Urbicus Lollius*, in the Time of *M. Aur. Antoninus*, about *A. D.* 140. The Altar is very large; hollow at the Top, (as usual) for Incense: On the Sides, are ingrav'd a Bull's Head; with Garlands, and Sacrificing Instruments.

The Teeth and Bones, which were discover'd, by the River *Tyne*'s breaking in upon the Bank, were found near the Foundations of the Old Fort; and



and neither higher up, nor lower down, than the Ruins of it seem to reach. I examin'd the Person who made the first Discovery; and had Money for presenting some of the Bones, from some Gentlemen in the Neighbourhood, and I was as exact, as possible, in the Remarks, which I made myself upon the Spot. Upon the whole, it appear'd to me: That there never was an entire Sceleton found in that Place.

The Teeth and Bones, lie in the Bank, in *Strata's*; sometimes at one, sometimes at two Yards depth, for above 200 Yards in length. In some places, there appears to have been a sort of Pavement or Foundation of Stone; which runs along with the Bones, *stratum super stratum*; sometimes above, sometimes below them. The Bones are of different Sizes: The Teeth, which are most perfect and entire, are very large; some three or four Inches in compass: Ribs, Shank-Bones, &c. (many of them) not exceeding the ordinary Dimensions of those of Sheep and Oxen. I could meet with no Remains of Horns; those being more easily corrupted, than the Bones, which are of a harder Substance. The Teeth look as if they were humane; but I cannot affirm them to be so: And they lie, sometimes, at so great a distance from the Ribs and Shank-Bones; that should any one take the pains to compute the Length of the Monster, from one to the other, they might calculate his Longitude, to 200 or 300 Yards, as reasonably, as to 22 Foot. The Teeth and Bones are in such Quantities; that, with the help of a Labourer or two, you might in a few Hours, gather a Bushel of them.

From the Account I have given, it may not be unreasonable to infer: That the Altar, here Dedicated to the *Tyrian Hercules*, was very famous and much frequented: That, Oxen, and such like Creatures, as Bisons and Bonassus, (with which the Country hereabouts did anciently abound: The entire Head and Horns of one, being lately dug up, in a marshy Ground; resembling exactly those Creatures, as they are describ'd by *Gesner*, and others,) were sacrificed thereon: And, that their Bones being all thrown together; and, according to the Superstition of those Times, laid under the Foundation and Pavement of the Fort, are the very same Bones, Teeth, Skulls, Ribs, &c. which, by the Rivers washing away the Bank, are now discover'd, and brought to Light. And, if I might be allow'd to guess a little farther; I might think it not impossible, that (as *Erkelens* in *Gelderland*, is *Herculis Castra*; and *Hertland* in *Cornwall* was *Herculis Promontorium*, so) upon the Recess of the *Romans*, the *Saxons* who succeeded them might call this noted Station *Hercul-cestre*, and by corruption, *Colceaster*; or *Colchester*, its modern Name. And, what may somewhat confirm the Conjecture, the adjacent Town of *Corbridge*, which, as I said, has risen out of its Ruins, is called in the Charter of *H. 1.* (whereby that King gave it to the Secular Canons of *Carlisle*, before the Erection, either of the Priory or Bishoprick,) *Colbruge*, and *Colburgh*, the same as *Col-cestre*: The Bridge, from whence it may seem to take its Denomination, being of a much later Erection. That Oxen used to be Sacrificed to *Hercules*, there needs no other Evidence,



Evidence, than the Altar itself; whereon an Ox's Head, with Sacrificing Instruments, are delineated.

*Large Teeth  
in the North  
of Ireland, by  
Fra. Nevile,  
Esq; n. 346.  
p. 367.*

XXVI. 1. There are in all four Teeth, two of a larger, and two of a smaller sort, the largest is the farthest Tooth in the under Jaw, the other is like it and belongs to the opposite Side; the lesser Tooth I take to be the third or fourth Tooth from it, and has its Fellow; these are all that were found, and one of them in a Piece of the Jawbone, which fell to dirt as soon as taken out of the Earth; there was part of the Scull found also of a very large Size and Thickness, but as soon as exposed to the Air, that mouldered away as the Jaw had done. By those Bits of Bones that were found, one might guess that they were Parts of those that were of a larger Size. The Place where this Monster lay was thus prepared, which makes me believe it had been buried, or that it had lain there since the Deluge. It was about four Foot under Ground, with a little Rising above the Superficies of the Earth, which was a Plain under the Foot of a Hill, and about 30 Yards from the Brook or thereabouts. The Bed whereon it lay had been laid with Fern, with that sort of Rushes here call'd *Sprits*, and with Bushes intermixed. Under this was a stiff blew Clay on which the Teeth and Bones were found: Above this was first a Mixture of yellow Clay and Sand much of the same Colour; under that a fine white sandy Clay which was next to the Bed: the Bed was for the most part a Foot thick, and in some Places thicker, with a Moisture clear through it; it lay sad and close and cut much like Turf, and would divide into Flakes, thicker or thinner as you would; and in every Layer the Seed of the Rushes was fresh as if new pull'd, so that it was in the Height of Seed-time that those Bones were lay'd there. The Branches of the Fern, in every Lay as we open'd them, were very distinguishable, as were the Seeds of the Rushes, and the Tops of Boughs. The whole Matter smelt very fower as it was dug, and tracing it I found it 34 Foot long, and about 20 or 22 Foot broad.

It will be well worth consideration what sort of a Creature this might be, whether Human or Animal; if Human, there was some reason for the Interment, and for that Preparation of the Bed it was laid on; if Animal, it was not worth the Trouble: if Human, it must be larger than any Giant we read of; if Animal, it could be no other than an Elephant, and we do not find that those Creatures were ever the Product of this Climate. And considering how long this must have lain here, I do not believe the Inhabitants then had any Curiosity or Conveniency to bring such into this Kingdom; for I suppose the best of their Ships could not carry one. Then if an Elephant, or some other Beast which must have proportion to the Teeth, it must have lain there ever since the Flood; and if so, then the Bed on which it lay must be of its own making: whence it will follow that the Flood coming on him while he lay in his Den; he was there drown'd, and cover'd with Slime or Mud, which since is turn'd into the Substance of the Earth before-







Fig. I.  
A



Fig. V.

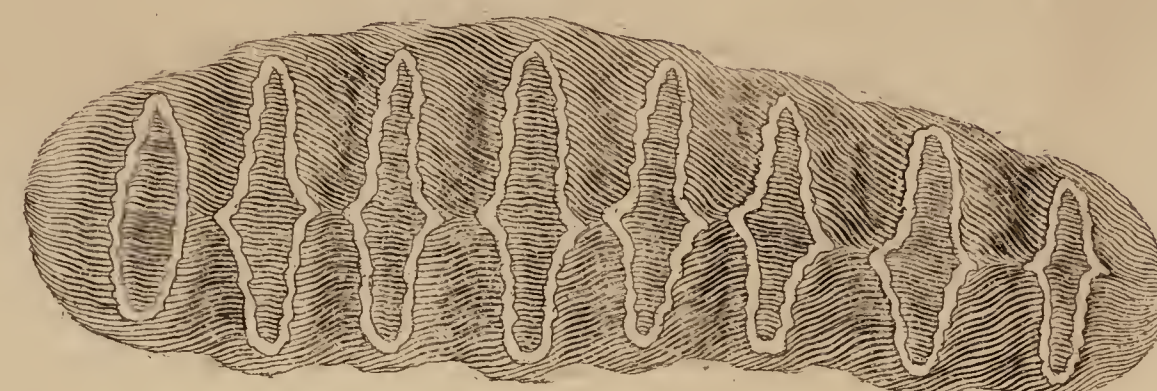
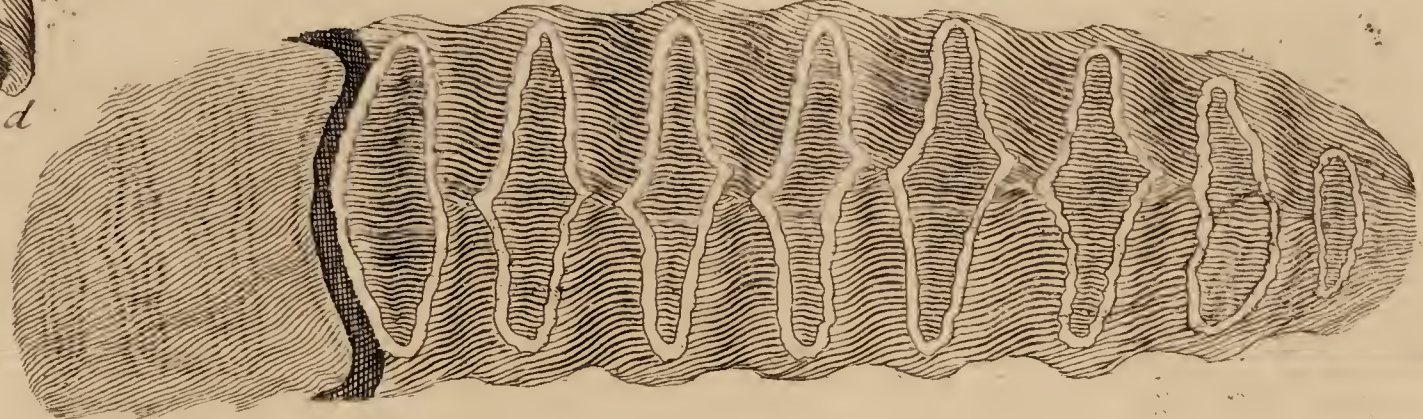


Fig. III



Fig. VI.



A Scale of Inches



E

Fig. II.

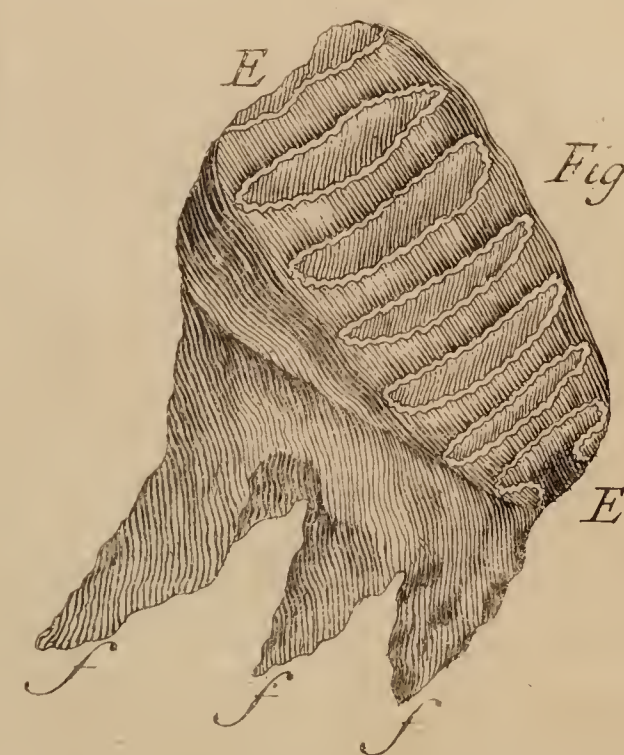


Fig. VII.

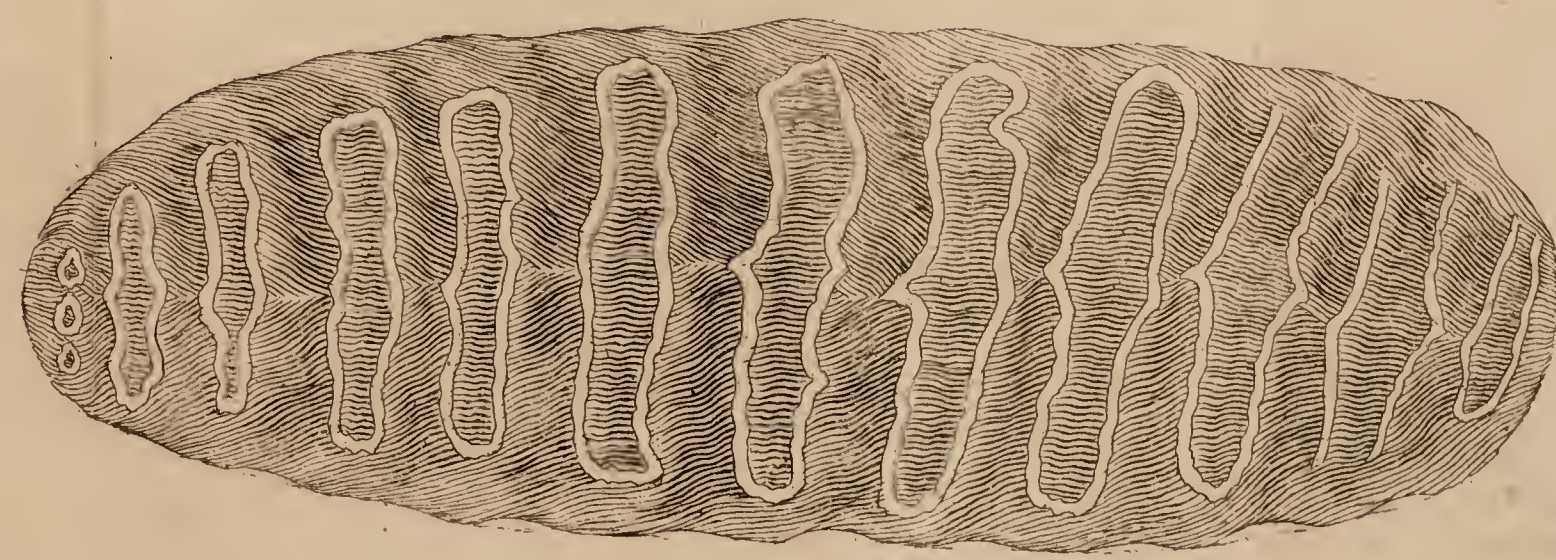
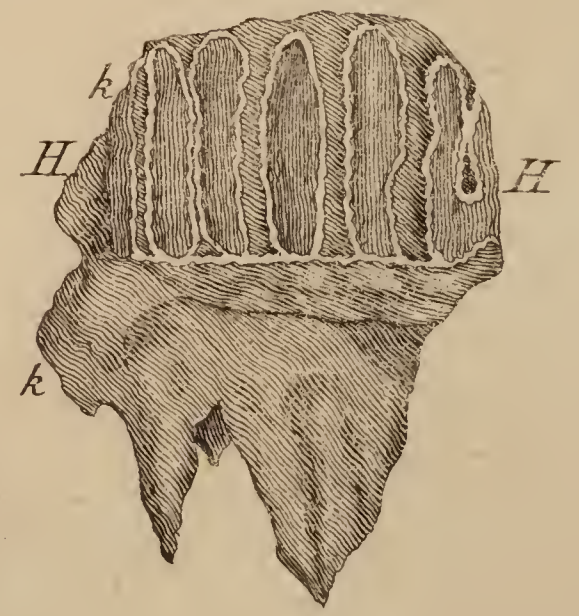


Fig. III





beforemention'd. I forgot to mention that there was a great many Nutshells found about the Bed, perhaps those might have been on the Bushes which compos'd part of the Bed.

The two large Teeth are of equal Weight, two Pound three Quarters each; the two little Teeth are six Ounces each; but there are some of them watted, and some of Holders that go into the Jaw broken off.

2. I am fully convinced, that they must certainly have been the *Four Grinding Teeth* in the lower Jaw of an *Elephant*, and that the many loose Fragments of those large Bones that were found with them, must have been Remains of the same *Animal*. This I take to be one of the greatest Rarities that has been yet discovered in this Country. In order to clear this Matter 'twill be first requisite to have recourse to, and explain the annex Figures. *Remarks by Dr. Tho. Molyneux, ib. p. 370.*

Fig. 1. *A. A.* is the large Grinder of the under Jaw on the right Side, weighing two Pounds and three Quarters of a Pound. *b. b. b. b. b. b. b.* are white, rough, indented Borders, seven in Number, of an irregular Shape, rising about the tenth of an Inch higher than the hard black shining Surface of the Tooth; this rough raised Work serves for the bruising and grinding the *Animal's* Food, the tough Grains of Rize, Leaves, Fruits, and the Boughs of Trees; and is made of so extream an hard Texture, that it resembles large knotted Threads of white *Glass*, laid on and closely fastned to the dark Superficies of the *Tooth* and answers that glassy Surface wherewith Nature has armed the Outside of the *Teeth* of most *Animals*, to prevent their wearing from the constant Attrition in Chewing of their Foods. *c. c. c. c. c.* is that part of the Tooth which rises above the Gums, and continues even now distinguish'd from the rest of the Bone, by having its Colour of a different Shade. *d. d. d. d. d. d. d.* are many strong Tangs or Roots, seemingly united altogether, by which the Tooth received its Sense and Nourishment, and tho' it was large and ponderous, by these it kept firmly fixt into the Jaw.

Plate 10.

For the Mechanism, Nature shews it self to have followed in framing the *Teeth* of this *Animal*, is no more than this: whereas in other Creatures, she has divided that bony Substance wherewith they chew their Food, each having its peculiar Roots to secure its Articulation in the Jawbone: she has in this of so great Bulk (as *Pliny the Naturalist* styles it *Terrestrium maximum Elephas*) for the greater Strength, Stabiliment, and Duration of its *Teeth*, and the better to provide for a compleat Attrition of the Aliment, in order to perfect the Digestion so thoroughly, as to sustain the Life of the Animal for two or three hundred Years, (as it is a common received Opinion in the *East*) she has, I say, contrived to make the Substance of the *Teeth* in their Roots below, and in their upper parts above the Gums, closely unite together; and coalescing thus, form a few large massy Teeth instead of many small ones.

As for instance, in *Man's Body*, that is of so much a less Size, the Number of the Teeth, (when the whole is compleat) reckons to thirty two, whereas in the large *Elephant*, the Teeth of both the Jaws amount in all but to eight, besides it's two great Tusks, which rather serve as horns for its de-

sence



fence than Teeth to prepare its Food, and therefore I think not so very properly call'd Teeth.

Fig. 2. *E. E.* is the smaller *Grinding Tooth* of the under Jaw on the same side: it's Surface covered over with the same white indented Work, as before describ'd for grinding of the Food. *f. f. f.* are three large Roots that kept it firmly fixt in the Jaw Bone. This smaller Tooth weighed full six Ounces.

Fig. 3. *G. G.* is the large *Grinder* of the under Jaw on the left side, much of the Size and Shape and Weight with it's fellow Tooth describ'd Figure the 1<sup>st</sup>. It shews its Roots and all its parts, with the rough protuberant white Work on its upper Surface made after the same contrivance and form'd after the same strong Model as the former. And truly, if one considers it, 'tis plain that were not the *Teeth* of this Creature made of so large a Size, and withal of so massy and firm a Substance, 'twere absolutely impossible they could resist the Force, and bear all that Pressure wherewith those vast Muscles exert themselves, that move the lower Jaw in Mastication in this so strong an Animal.

Fig. 4. *H. H.* is the smaller *Grinding Tooth* of the under Jaw on the same side; it is less compleat than the small Tooth describ'd before in Figure 2<sup>d</sup>. for some of the Root is wanting, and part of its outward grinding Surface is broke off at *k. k.* so that it weighs somewhat less; yet what remains exactly shews the same kind of Work and Shape of the other Tooth, that answer'd it on the right Side.

These *Four Teeth* here describ'd, fully compleat the Sett of the Teeth, wherewith Nature has furnished the lower Jaw of the *Elephant*; and are answered by just as many more, formed after the same manner in the upper Jaw, as Dr. *Moulins* informs us, who dissected the *Elephant* that was burnt here at *Dublin* in 1681. In it's Anatomy p. 40. speaking of the Teeth, he assures, there were besides the Tusks only four Teeth in each Jaw, two in every side: and that these eight Teeth were all *Molares*, so that he had no *Incisores*.

But notwithstanding this, perhaps it will be said, we may not hastily conclude from hence, that our *Great Teeth* dug up in *Ireland* must certainly have been the *Four Grinders* of an *Elephant*, since they might as well belong to some other large kind of *Terrestrial* or *Marine Animal*. As for the Hint of their being *Human* or *Gigantick*, 'tis so groundless a Thought, and so contradictory to *comparative Anatomy* and all *Natural History*, it does not deserve our Consideration.

To obviate this, I shall take notice first in general, that the differing Kinds of living Creatures, wherewith Nature has stock'd the World, are not more distinguish'd by the Make of any part of their Bodies from one another than by the various Shape and Disposition of their *Teeth*: and hence it is, we shall find any two distinct *Classes* of *Animals* that do exactly agree in the same Make and Ranging of their Teeth.

But yet to be more particular, I shall here set down at length the Words of two late Authors, that purposely have described the *Teeth* of the *Elephant*. The first Mr. \* *Patrick Blair*, who says, Dr. *Moulins* well observes that

\* *Phil. Transf.*  
n. 325 p. 11 O.



that they are all Molares, being two Inches broad in that part of them where-with they Grind, and six Inches and a half long on the right Side, and five Inches and a half on the Left. Their Surface, tho' flat, is yet very unequal, for they have alternately placed, running from the Right to the Left Side, an Hollowness and then an Eminence; and this Eminence is surrounded by a rough protuberant Border. There are Nine of these Hollownesses and as many Eminences undulated as they paint Sea Waves.

'Tis remarkable how very exactly all this agrees with our Figures; 'tis true those Hollownesses and Eminences which he mentions to be Nine, do not so nicely hit with the Number of those in our Teeth; but this Difference proceeds from hence, that he describes here the Grinders of the upper, whereas ours are the Teeth of the lower Jaw; tho' such a Distinction as this, I am apt to think, may very well arise even in those of the same Jaw, in various Animals, from some peculiar Disposition in one from another; nay and perhaps in the same Animal, at differing times, according as it happens to be older or younger, but this by the bye.

A little farther he says, \* *The hind Tooth of the Right Side is four Inches, and that on the Left five; the one half of their Surface, where they begin to appear above the Gums, is semicircular, with the forementioned Ridges and Sulci running transversely, four on the Right Side and five on the Left, the other half (or Tooth I suppose he means) has five of these Eminences where it grinds on the Right, and four on the Left: each of the four Teeth is six Inches long, and has six or seven of the forementioned Eminences and as many Depressions: these Teeth are the most firm, solid and weighty Bones of any Animal yet known.* \* *Phil. Tr. n. 326. p. 114.*

The other Author I shall produce is † Mr. Ray, who has the following Words of the Elephant, *Os pro mole Belluæ parvum, quatuor in utraq̃ue maxillâ Dentibus molaribus seu Dentium molarium Massis instructum; si quidem plurimi Dentes in Os solidum & durum ita infixi sunt, ut cum eo & inter se unum & continuum Corpus efficiant. Dentes hi lineas parallelas undulatas octo vel novem in superficie massæ efficiunt; suntque reliquo ossè candidiores: Massæ integræ, Dentium singularium modo, per Gomphosin maxillis inseruntur. Incisoribus omnino caret.* Now by comparing the Particulars of both Accounts with the Description and Figure we have before given of the Teeth dug up in Ireland, we may observe how they all agree exactly, even so as they tally together. But then perhaps it will be ask'd what is become of all the rest of the Teeth that were in the upper Jaw, which being as firm and solid Bones as those that are here preserved, might for the same reason have still remained entire. † *Synops. Animal. Quadrup.*

But since we find it otherwise, 'tis obvious to imagine a probable Conjecture how this might come about. From what Mr. Nevil mentions in his Letter, 'tis plain that the Bed where all these Bones were found, must once have been the outward Surface of the Earth, the Green Sod producing Rushes, Fern and Nuts: and when the heavy Beast first fell dead upon this Spot, the Scull, with all the Bones and Teeth of the upper Jaw, being the highest Parts of the Animal, might likely fall in such a Posture, as to be exposed



some while above the *Earth*; tho' those of the under Jaw first coming to the Ground, might make themselves a Bed, and being covered with the Mould remain preserv'd; whilst the upper Teeth, and most of the other Bones, lying exposed to the Injuries of the Air and Weather, before they got a Covering, might rot and quickly moulder all away.

But tho' this be allowed, yet still a greater Difficulty remains unsolv'd; how this large body'd *Animal*, a *Native* of the remote warm *Climates* of the *World*, should be deposited in this wild *Northern Island*, (where *Greeks* or *Romans* never had a footing) so many Miles from Sea, and distant from those Places of the Isle where People might most probably resort. And still to make the Difficulty yet greater, we must consider, not only from the dark black Colour of the Teeth, contracted by their lying long under Ground and the remarkable Alteration wrought on their bony Substance, which (by the mineral Steams and Exhalations it has imbib'd whilst it was in the Earth) is now become more solid, hard, and ponderous, than it was naturally at first, (nay in some Parts we find it plainly petrified) but also from the perishing of all the other Bones of the Animal's Body, and from the considerable *Depth* of *Earth* that covered those that were found: we must conclude, I say from hence, that they have lain in this Place for many Centuries: I won't say with Mr. *Nevil* ever since the *Flood*, because I can't suppose that the slight Texture of vegetable Substances, *Nutts* and the Seeds of *Rushes*, could possibly have been preserv'd so long: But this, at least, may safely be affirmed, that these Remains must be Cotemporaries with some of the remote Ages of the *World*; which carries us so far back into the earliest Times, that we can ne'er imagine the rude Inhabitants of *Ireland*, or any of their neighbouring Countries, were Masters of so much Art, in those Days of Ignorance and Darkness, as to make Carriages by Sea strong and capable, or of Curiosity and Politeness enough, to transport a Beast of this large Size from those far distant Countries where 'twas bred; which they that now attempt do find a Work of vast Care, Trouble and Expence, even in this Age wherein *Navigation* is brought to such perfection.

These Considerations, grounded on other Instances of the like kind, make me inclined to think this *Elephant* we are speaking of, might not be brought hither by any Care or Industry of *Man*: but the Surface of this Terraqueous Globe might, in the earliest Ages of the *World*, after the *Deluge*, but before all Records of our oldest *Histories*, differ widely from its present *Geography*, as to the Distribution of the *Ocean* and *Dry-land*, its *Islands*, *Continents* and *Shores*, so as to allow this Beast, and others of its kind, for ought I know, that may by some such Accident hereafter be luckily discovered, a free and open Passage into this Country from the Continent. For otherwise, how can we e'er explain that that other vast, large, stately *Animal* the *Moose-Deer*, little inferior to the *Elephant* itself, could have been brought into *Ireland*, (where elsewhere I have shewn it formerly was common) from distant *North America*, even long before that Quarter of the World was known, and is the only Region I can hear, where this great Beast is found at present. And can we well imagine that *Foxes*, *Otters*, *Badgers*, *Tigers*, *Wolves*,  
with



with *Linxes* and such ravenous *Animals* as we have been told, have lately been discovered by the great Snows that fell this present Winter in the *Island* of *Sardinia* and other Places, should ever be imported (being useless noxious Beasts of Prey) by the Industry of *Man*, to propagate in *Islands*, that they might destroy *Men's* Food and Flocks, and make their Lives not only uneasy but unsafe? Nay how can we suppose that *Birds* of shortest Flight, the various Sorts of poisonous *Serpents*, and of offensive *Creeping Vermin*, with all the various Tribes of smaller *Insects*, could possibly be found in *Islands*, unless they had been stock'd with those Inhabitants when the Intercourse between them and the Continent was free and open.

But in whatever manner this *Elephant* (to return to our Subject) might first have made its way for *Ireland*; this is beyond dispute, that the *Bones* of *Elephants* have been discovered deep under Ground, in other Places as well as this Kingdom; and those too out of the way, far distant from the Native Countries of this Animal.

For not many Years ago, in a Hill near *Erfurt*, a Town of the *Upper Saxony* in *Germany*, several Parts of the *Skeleton* of an *Elephant* were Dug up: on which Occasion *Wilhelmus Ernestus Tentzelius* Historiographer to the *Duke* of *Saxony*, writ a Letter to the very learned *Antonio Magliabechi*, Library keeper to the great *Duke* of *Florence*. And I am well persuaded, by the best Construction I can make of those imperfect and obscure Accounts, we have in \* *Evert Isbrand Idde's* curious Travels from *Muscovy* to *China* \* *Ch. VII.* over Land; (which he confesses he only gathered from the barbarous *Ostiacks* Inhabitants of that Country) concerning the vast *Teeth* and *Bones* and *Limbs* of *Mammuths* as he calls them, frequently found (and diligently sought after to make profit of them) in the Hills, and Banks of several Rivers in *Siberia*, the *Keta*, *Jenize*, *Trugan*, *Montgamssea* and *Lena*; that they are nothing else but the Remains and *Skeletons* of *Elephants* buried there, and accidentally discovered by the *Earth's* opening, and falling down on the sudden Thaws, after severe long Frosts.

But *Mr. Camden* in his *Britannia* is of opinion, that those great monstrous *Teeth* and *Bones*, which he takes notice to have been at several times dug up in many parts of *Great Britain*, must have been the Remains of *Elephants*; but then he thinks, they must be of those that *Dion Cassius* tells us, the *Roman* Emperor *Claudius* brought over, when he made his Expedition into that *Island*. But that this truly is so, I own is but a surmise as yet, and has not been so fairly proved by him or any other, as that we can rely upon't with satisfaction.

*Mr. W. † Somner's* Account of the *Bones* dug up near *Chartham*, agrees † *Phil. Transf.* in many of its Circumstances with that of *Mr. Nevil*; as that the *Teeth* *n. 272. v.* were all Grinders, four in number, found with other large broken *Bones* *supr. p. 27.* near a Brook, and in a Clayey Earth, without a Stone; but then the weight and magnitude of our largest *Teeth* so far surpass those that were found in *England*, that these did not come up to a fifth Part of those, which shews they could not be the *Teeth* of the same Animal. I must confess the Author does not so much as suspect they were *Elephant's Teeth*, but on the contrary



trary is of opinion that they belong'd to another *Species*, the *Hippopotamus* or *River-Horse*, a Beast that's yet a greater Stranger in these Parts of the World, than the *Elephant* it self; and therefore it's Passage hither can never be accounted for, but by some such like Supposition as we have made.

And if the *Figures* of the *Teeth* there given us be genuine and well expressed, they no way seem to agree either in Shape or Make, or in that particular and *Characteristick* Work on the grinding Superficies, with the *Teeth* of the *Elephant*; or with the Description and Figures we have given, which I am sure are both correct and natural.

Further Remarks, *ib.*  
p. 383.

3. This Letter of Mr. *Nevile* with Dr. *Molineux's* curious Draughts of the *Teeth*, and his learned Remarks upon them, having been produced and read before the *Royal Society*, they ordered that what *Teeth* they had of like sort should be look'd out and laid before them; to which Sir *Hans Sloane* was pleased to furnish a yet greater Variety, out of his incomparable Collection of *Natural Rarities*. And to obviate all Doubts, there being at this time in *Westminster* the entire Skull of a large *Elephant* with the *Teeth* in it, That was likewise ordered to be viewed and compared with the *Figures*: which done, it appeared that the *Teeth* in question could be no other than those of an *Elephant*.

\* Lib. XI.  
cap. 37.

† *Phil. Trans.*  
n. 234. Abr.  
Vol. II.  
p. 438.

By this Enquiry we were likewise satisfied, that the Number of *Teeth* found, being but four, was no Objection: it appearing that the Number of *Molares* in this Animal is not certain. \* *Pliny* says expressly, *Dentes Elephantus ad mandendum quatuor, præter eos qui prominent*. And in the Remains of that mighty *Elephant* described by † *Tenzelius*: there were no more than four *Teeth* found. In that at *Westminster* there are Six, viz. One in each lower Jaw, and Two in each of the Upper, whereof the inner Tooth is about three times as long as the other, and both together longer than those of the under Jaw by about an Inch; the upper small *Teeth* being much worn by grinding. These we have thought fit to represent by *Fig. 5.* shewing the rough grinding Surface of the left under Tooth, being considerably Concave; and by *Fig. 6.* the same Roughness on the upper *Teeth* is shewn, having a Convexity tallying with the Concavity of the under, which is a Circumstance not observed by any of those that have described them. And altho, by the Observation of Mr. *Du Verney*, Dr. *Moulins*, and Mr. *Blair*, who dissected three different *Elephants*, it appear that each of them had eight *Molares*: yet from them it is also evident that in the division of them Nature observes no Rule. For Dr. *Moulins* found the two *Teeth* in each of the upper Jaws of that he dissected, to be divided after a different manner; so that the inner Tooth on the one side, and the outer on the other, was bigger than its adjoining Fellow, yet not so as to be very unequal: and Mr. *Du Verney* and Mr. *Blair* had on both sides the much greater Tooth outwards: whereas the *Westminster-Skull*, on the contrary, has only a small one outwards, and the much greater Grinder within. All which considered, we may with Assurance conclude, that this *Elephant* found in *Ireland* had but four *Teeth* in his Head when he died; and that the two Greater were those of the upper Jaws, and the other two those of the Under. Again, by the  
Size



Size of the grinding Part, we may conclude these to be the Teeth of a very young and small Elephant; since they are not much above half the Length of those that are to be seen at *Westminster*, which belonged to a Beast of not more than between 10 and 11 Foot high; nor much above one Third of the Length of a foffile Elephant's Grinder in the *Royal Society's* Repository, the which is here represented by *Fig. 7.* (all the *Figures* being drawn to the Scale of half their true Dimensions.) Hence it is not to be marvelled that the Bones of so young an Animal, having not acquired their Firmity, as being in a growing State, should be dissolved by long lying in the Earth, as also the Roots of the Teeth.

On this Occasion, perhaps it may not be amiss to quote a Passage out of *Mathew Paris* his History, who assures us, that in his Time *Louis IX.* (afterwards *St. Louis*) King of *France*, made a Present of an Elephant to his Cotemporary *Henry III.* of *England*; and that in the Year 1255, after the *Eng-lish* had been fourscore Years Masters of *Ireland*. Of this says *Matthew*, *Nec credimus quod unquam aliquis Elephas visus est in Anglia præter illum.*

XXVII. In *Albany* in *New-England* were lately found Bones and Teeth of some large Animals, which for some reasons are judged to be human; particularly a Tooth brought from the Place where it was found, to *New York*, 1705. being a very large Grinder, weighed four Pounds and  $\frac{3}{4}$ , with a Bone suppos'd to be a Thigh Bone 17 Foot long. There is another Tooth, broad and flat like a fore Tooth, four Fingers broad; the Bones crumble to pieces in the Air after they are dug up; they were found near a Place call'd *Claverack*, about 30 Miles on the side of *Albany*, towards *Boston*. One is like the Eye Tooth of a Man, it has four Prongs or Roots, flat and something worn, on the top it was six Inches high, lacking one eighth, as it stood upright on its Root, and almost thirteen Inches in circumference; it weigh'd two Pounds four Ounces *Troy* weight: There was another near a Pound heavier, found under the Bank of *Hudson's* River, about fifty Leagues from the Sea, a great way below the Surface of the Earth, where the Ground is of a different Colour and Substance from the other Ground, for seventy five Foot long, which they suppose to be from the rotting of the Body, to which these Bones and Teeth did, as suppose, once belong.

XXVIII. At *Wrabness*, a small Village situate in the most Eastern parts of *Essex*, upon the River *Stowr*, near *Harwich*, diverse Bones of an extraordinary bigness, were found at 15 or 16 Foot beneath the Surface of the Earth, in digging for Gravel to mend the Roads with, &c. the largest and most remarkable of which, was procured, and sent to me, by *Mr. Rich*, Minister of the Place.

We read in \* *Cambden*, that in the time of King *Richard II.* and in the Reign of Queen *Eliz.* there were found in the most Eastern Promontory of *Essex*, at a place called *Cidulfiness*, which I take to be *Walton*, large Teeth, and Bones of an extraordinary bulk, which were esteemed the Bones of Giants. But *Mr. Childrey* rather thinks them to be the Bones and Teeth of some Elephant, buried there by their loving Masters the *Romans*.

That



That these were the Bones and Teeth of some Elephant, I am prone to believe; first, because they far surpass in Magnitude the Bones, &c. of the largest Creatures that we have at this day in our Island. Secondly, Because 'tis evident from *Dio Cassius*, as quoted by Mr. \* *Camden*, that abundance of Elephants were brought over into *England*, by the Emperor *Claudius*, in the War with the *Britains*; yea, into *Essex* itself; as appears from the same *Dio* a little after. Thirdly, In comparing this Bone with the Osteology of Dr. *Mullins* in his Anatomical Account of the Elephant burnt at *Dublin*, &c. I find it perfectly agree to and with the *Os Humeri* thereof, not only to outward Appearance or Form, but to Measure also; whence we may conclude, these were the Bones of some Elephant, rather than any other Animal.

\* *Britannia*.  
p. 347.

*Dimensions of*  
*Human Bones*  
*near St. Al-*  
*bans, com. by*  
*Mr. Chesel-*  
*den. n. 333.*  
*p. 436.*

XXIX. The Circumference of the Skull, according to its length 26 Inches, according to its breadth 23 Inches.

The greatest Diameter of each *Os innominatum* 12 Inches.

The left *Os Femoris* 24 Inches long, having only One, and that the great *Trochanter*. The right *Os Femoris* 23 Inches long, having three *Trochanter Processus*.

Each *Tibia* 21 Inches long.

If all the Parts bore a due Proportion, this Man must have been eight Foot high. They were found near an Urn inscrib'd *Marcus Antoninus*; in the Place of the *Roman Camp* near *St. Albans*.

*Antiquities in*  
*New Eng-*  
*land, by Dr.*  
*Mather. n.*  
*339. p. 70.*

XXX. At a place call'd *Amuskeag*, a little above the hideous Falls of *Merimack* River, is a huge Rock in the midst of the Stream, on the top of which are a great number of Pits, made exactly round like Barrels or Hog-heads of different Capacities, some so large as to hold several Tuns; the Natives know nothing of the Time they were made, but the neighbouring *Indians* have been wont to hide their Provisions in them in their Wars with the *Maqua's*, affirming that God had cut them out for that Use for them. They seem plainly to be Artificial.

Plate 8. B.

At *Taunton*, by the side of a tiding River, part in, part out of the River, is a large Rock; on the perpendicular side of which, next to the Stream, are seven or eight Lines, about seven or eight Foot long, and about a Foot wide each of them ingraven with unaccountable Characters, not like any known Character. Two of them are represented, *Fig. 7*.

*An ancient*  
*Tuscan In-*  
*scription,*  
*from Dr.*  
*Hickes to Sir*  
*Hans Sloane.*  
*n. 302. p.*  
*2076.*

XXXI. *Perlustravi, Vir Clarissime, quam descriptam ad Societatem Regiam perferendam dederunt D. D. Spanhemius & Geoffroy, Iconem, unà cum D. Boivini dissertatione de eâ Gallicè scriptâ, in qua TAGIS esse juvenili specie imaginem istam, quæ ad te nuper à Lutetiâ Parisiorum missa est, multis argumentis contendit. Verùm sive TAGES apud Hetruscos Auruspicinæ auctor, sive gladiator, sive forte qui à Ludis publicis Lauream reportaverit, sive denique quis alius sit, quem Icon illa adumbrat, ea, quæ femori ejus, crurique sinistro Characteribus Hetruscis inscribuntur, pro Alphabeticis linguæ Hetruscæ, quæ docti nobis dederunt, aut dedisse sperarunt, alio alio-*  
que



*[Faint, illegible handwritten text on lined paper, possibly a ledger or account book. The text is mirrored across the page, suggesting bleed-through from the reverse side.]*



Tab. I.

— A . B . C . D . E . F . G . H . I . K . L . M . N . O . P . Q . R . S . T . V . X . Y . Z .  
R & A . D . C . . E . . 8 . . I . . J . M . N . O . 9 . . Я . 2 . T . V . . Z .

Tab. II.

a . b . c . d . e . f . g . h . i . k . l . m . n . o . p . q . r . s . t . u . x . y . z .  
A . . C . A . E . F . C . . 7 . K . L . W . П . 0 . . . 3 . N . 4 . ↓ . X .  
. Δ . . . L . M . N . . . 8 . 9 . V .  
. 1 . . . Y . h . П . . . A . 1 . V .  
. h . П . . . M . 1 .  
. 5 . 1 .  
. 3 .  
. N .

Tab. III.

a . β . γ . δ . ε . ζ . η . θ . ι . κ . λ . μ . ν . ξ . ο . π . ρ . σ . τ . υ . φ . χ . ψ . ω .  
A . B . . d . 1 . 2 . . I . K . 1 . M . N . . D . 1 . 9 . 0 . 1 . 2 . 3 . . 8 .  
Y<sub>pro</sub> OY . . H . . R . . F . . 6 .

Tab. IV.

a . b . c . d . e . f . g . i . k . l . m . n . o . p . r . s . t . u .  
A . BB . 1 . D . E . Y . 2 . 1 . K . L . M . N . 0 . P . 1 . S . 1 . V .  
. db . . . 0 .



que modo per literas Romanas Græcasq; eatenus facilè describi possunt, quatenus Scriptionis Characteres integri, & illæsi in eis supersunt. Alphabeta verò, quibus utimur in iis legendis, quatuor sunt: Scilicet Patris *Francisci Giambullari* unum, alterum Anonymi Descriptoris, tertium *Jani Gruteri*, & quartum *Andreas Brogiotti F.*

Primum, in quo Characterum Hetruscorum figuras, & potestates expressit \* *Franciscus Giambullari*, extat in egregio suo libello de Origine Linguae Florentinae Italicè Scripto, cui titulus hic est. *Origine della Lingua Fiorentina: altrimenti IL GELLO DI M. PIER. FRANCESCO GIAMBULLARI Acadimico Fiorentino.* in FIORENZA M.D.XLIX. † characterum Hetruscorum, figuræ, quas à dextrâ versus sinistram pictas dicit, cum eorum potestatibus per literas Romanas expressis delineantur ut in Tab. I.

\* *Vide hujus viri Eulogium in præfatione generali Georgii Hickesii ad Antiquæ Literature Septentrionalis duos libros nuper Oxoniæ à se Editos. p. 4. & 24.*

† p. 97. Plate II.

In secundo, quod invenire est inter monumenta Hetrusca, quæ ad vestram Societatem misit *R. Fabrettus*, Hetruscorum characterum figuræ, & potestates ab Anonymo eo modo in Tab. II. describuntur.

In tertio, *Janus Gruterus* libri sui *vett. Inscriptionum* pag. CLXV. tabularum *Eugubinarum* characteres Hetruscos, cum eorum potestatibus per Græcas literas designatis, ut eas ipse animo finxit, exhibet; quas videas in Tab. III.

In quarto autem, quod *Andreas Brogiottus F.* delineavit in libro suo, qui inscribitur INDICE DE CARATTERI con l'inventori & Nomi di essi esistenti NELLA STAMPA VATICANA & CAMERALE in ROMA. M.DC.XXVIII. Hetrusci Characteres septem tabularum ænearum, quæ *Eugubii* jam pridem repertæ erant, longe aliter ac apud *Gruterum*, & me judice, multo etiam verius, cum valore suo per literas Romanas denotato, exprimuntur, ut in Tab. IV.

Juxta primum Alphabetorum, quæ in tabulis exhibentur, uno atque altero Characterem etiam ex secundo in subsidium evocatis, inscriptionis Hetruscæ, quæ in sinistro femine crureque cernitur Ectypi tui TAGIS à dextra sinistram versus, lectio hæc esse videtur:

MI. GLEDEM: STULPOE: ADI<sup>a</sup>. IMI  
CASSI: D<sup>b</sup>. GD<sup>c</sup>. II. XD. CECLES: CEVA:

<sup>a</sup> forte K.  
<sup>b</sup> forte A.  
<sup>c</sup> forte V.

Juxta autem istud *Jani Gruteri*, quod tertium est ordine Alphabetum, sic legenda est inscriptio,

μι: ωζεδεμ. υλζαωε: αοιιμ  
ωαυ . . ι: ο. <sup>d</sup>. ωο<sup>e</sup>. χο. πεπζεν: πε<sup>f</sup>. α:

<sup>d</sup> forte N.  
<sup>e</sup> forte M I.  
<sup>f</sup> forte T Z.

Verùm secundum ultimum, quod delineavit *Andreas Brogiottus F.* sic describenda esse videtur.



g forte Z.

MI. GLEDEM: RULAGE: ADIFIMI

h forte ZZ.

GA: I: D, ... GG ... XD. CECLLEN: CETA:

Inscriptions at

York, by Mr.

Thoresby. n.

303. p. 2145.

\*Ph.Tr.n.149.

p. 238. Abr.

Vol.III.p.419.

Camden's

Brit. N. E. p.

708.

plate 8.

Burton's Com.

upon Anton.

lin. p. 78.

XXXII. 1. A Roman Monument was lately discovered at York in digging a Cellar in Coning-street, not far from the Roman Wall and Multangular Tower, that \*Dr. Lister has given so curious and particular a Description of. This Monument, Dedicated to the Genius, or Tutelar Deity of the Place, is not of that coarse Rag, that the generality of the Roman Monuments are, but of the finer Gritt: 'Tis 21 Inches long and 11 broad, and is inscribed GENIO LOCI FELICITER. There was a larger Stone found with it, but without any Inscription; nor is there upon either of them the representation of a Serpent, or a young Visage, by both which the Ancients sometimes described these *Dii Topici*; if the Name had been added, it would have gratified the Curiosity of the Neoteric Antiquaries; but they must yet acquiesce (for ought I know) in the old DVI, who is said to be the Tutelar Deity of the City of the Brigantes; from which *Diw*, as the Britains call'd him, *Dewsbury*, or *Duisburg* in this Neighbourhood, seems to have receiv'd its name; a place now chiefly noted for a sort of coarse Cloath there made, and thence called *Duberians*. The Monument is as Fig. 8.

The Author of this Votive Monument seems to have had the same Superstitious Veneration for the Genius of York, as those at Rome had for theirs, whose Name they were prohibited to utter, or enquire after; hence it is upon their Coins the Name of this Deity is never expressed, but in a more general manner by *Genius P. R.* or *Pop. Rom.* Such a one I have of *Constantius*, minted at London, as appears by the Exurg LON. under the Effigies of that Deity, with a *Patera* in the Right Hand, and *Cornucopia* in the Left, inscribed GENIO POPULI ROMANI. I rather instance in that of this Emperor (the Father of *Constantine* the Great) because he made York his Imperial Seat, and was here Deified; the Medal of whose *Apotheosis* I also have, minted at the same place and inscribed MEMORIA FELIX, which I mention (tho' nothing relating to the Genius) because of the expression of a noted Antiquary, "That Rome in the height of its greatness, had not a more glorious and gallant show to exhibit, than what this poor piece of Copper would express. As the Genius of the City of Rome was expressed by G. P. R. so that of the Commonwealth, in a most sordid Flattery, by that of the Emperor, who they pretended to be their Happy Genius. I have one even of Nero, and not only after his *Quinquennium*, but the year after he had laid most of the City in Ashes; yet by the express order of the Senate, inscribed GENIO AUGUSTI. S. C. Some of the Fathers have therefore justly reproach'd the Romans, for paying a greater Veneration to the Genii of their Emperors, than to Jupiter their supream God. This Custom of Deifying the Genii, and that of assigning Gods for defence of particular



particular Cities, is very ancient, as appears by what the Prophet *Jeremiah* saith of revolting *Judah*, *According to the number of thy Cities are thy Gods*; after the manner of the Heathen, who, according to *Varro*, had above \* thirty thousand; and yet notwithstanding this prodigious number, it is evident from their Medals, that several Cities were sometimes assigned to the same Tutelar Deity; thus the *Greeks* (from whom the *Romans* receiv'd this and several other of their Superstitions) committed both *Magnesia* and *Smyrna* to the protection of *Cybele*. Medals of the former are more common, of the latter more rare. I have one which has the Effigies of that *Mother of the Gods* with her Towered Head, and CMYPNA; upon the Reverse is a Lyon Passant with CMYPNAION. I have also a large curious Medal of *Julius Philippus*, that would tempt us to believe that *Antioch* also was devoted to the same *Cybele*, for it has round her Head with the Turreted Crown ANTIOKEON MHTPOKOAN. with Δ (or rather Λ) E and SC on each side the Head. I must own my self somewhat at a loss about the latter word, except the *Greek* and *Roman* Tongues began then to admit of a sort of Mongril Mixture, so that from MHTEP and *Colonus*, might proceed MHTPOKOANON, and so the *Antiochians* have the Title of the Men of the Mother-Colony, the Λ E which are *Greek*, the SC in *Latin* Characters, the former signifying *Lustrum Quintum*, the other *Senatus Consulto*, seem to countenance this Conjecture, the *Roman* S being different from that in ΦΙΛΙΠΠΟΣ and CEBα505 upon the same Coin.

*Jer. ii. 28.*  
*and xi. 13.*  
\* *Pool's Synop.*  
*Critic. in loc.*

This Curiosity of the City of *Antioch* is not so valuable as it was the Metropolis of all *Syria*, and highly applauded by *Ammianus Marcellinus* (who lived within a hundred years of this time) as it is because here the name of *Christians* was first taken up, and that *St. Paul* both preached and kept a Synod here, as *Eusebius* tells us, and so another I have of *Antoninus Pius*, inscribed BEPOIAION, which is more valuable in my Fancy for that passage *Acts XVII. 2.* than if it could be certainly ascribed to the noblest of the four Cities that bore the same Name.

2. A Funeral Monument, whereupon, under the Statue (in *Basse-relieve*) of the Standard-bearer of the 9th Legion, is this Inscription.

n. 305 p. 2194.

L DVCCIVS

\* Lubens voluit

\* L. VOL. RVFI

NVS. VIEN

SIGN. LEG. VIII.

AN. XXII.

Hic situs est

H. S. E.



This Monument was found in *Trinity-yard* in *Micklegate* at *York*. That the 9th Legion was in *Britain* in *Galba's* time, and that it was also *Hispaniensis*, appears from the very Learned *Sir Henry Savile's* Notes at the end of his Edition of *Tacitus*; but that it, as well as the VIth and the XXth, was also called *Victrix*, or that it resided at *York*, has not been observed before; and yet both are evident from this Inscription upon a *Roman Brick* found there. LEG. IX. VIC.

This is also an Argument of the Peace these Parts enjoyed at that time, (possibly the latter end of *Severus's* Reign,) making Bricks, casting up Highways, &c. being the usual employment of Soldiers at such vacancies.

*Sir Hen. Savile* was of opinion that this *Nona Hispaniensis* in *Britannia* was one of those established by *Tiberius*, *Caius*, or *Claudius*, or peradventure in the later times of *Augustus*; but however that it was certainly here in *Nero's* Reign; and that *Pætus Cerealis* was then Lieutenant thereof is indisputably evident from *Tacitus*, (*lib. 14. cap. 10.*) who gives a lamentable account of the slaughter of seventy thousand Citizens and Confederates, by the enraged *Boadicia*, in which number was all the Foot of this ninth Legion: *Cerealis* with the Horse hardly escaping. I suppose it needless to add, that this Number is frequently by the *Romans* writ VIII as well as IX; for one that is but competently vers'd in their Coins or Inscriptions, cannot but have observed instances of both kinds: however, *Roger Gale*, Esq; was so kind as to send me a new Transcript; and I have by me also a third, lately taken by a grave Divine; all which agree that it is the IXth Legion, which is also confirm'd by the other Inscription upon the Brick, which was but lately found. I shall only add what *Mr. Tho. Hearne* of *Oxford* writes, "I am mightily pleased with the Inscriptions you sent me relating to the 9th Legion, there being now no room to doubt about the place of Residence, a thing which was unknown before; and for that reason, those who have written about the *Roman* Legions have said nothing about this, but leave us quite in the dark; only *Ursatus* \* does remark, that it must be somewhere in *Britain*, because *Tacitus* tells us, that when the Colony at *Camalodunum* was destroyed by *Boadicia*, *Pætilius Cerealis*, Legate of the IXth Legion, came to their assistance; but yet he makes no mention of its being stiled *Victrix*."

\* De Notis  
Rom.

An ancient Inscription from  
Amagon, by  
Dr. Musgrave.  
p. 337 p. 157.  
Plate 12.

XXXIII. Jam nunc ante oculos Marmor est, *Tarracone* inventum, album, uncias decem cum semisse longum, octo & dimidiam latum; in quo Inscrip-  
tione hic dimidio minoribus ære *Cyprio* incisus, integre legenda est ut Fig. 1.

Diis Manibus. Camilius Saturnalis Camiliæ Natulæ. Patronæ merentissimæ fecit.

*Camilius Saturnalis*, olim servus, at jam Libertus, utpote a *Camilia Natula* manumissus, ea de causa Patronæ, a qua cum Libertate Nomen accepit, grate hoc monumentum posuit.



MR D

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Unc. 10  $\frac{1}{2}$ .

Fig. 2.

IMP. CAESAR. M. ANTONIVS  
 GORDIANVS. P. F. AVG.  
 PRINCIPIA. ET. ARMAMEN  
 TARIA. CONLAPSA. RESTITV  
 IT PER MAECIVM. FVSCM. ILLG  
 AVG. PR. CRANTE. M. AVR  
 QVIRINO. PR. CH. ILL. GOR

Fig. 3.





Plurima sunt hujusmodi passim monumenta; quod ex *Grutero*, *Reinesio*, aliisq; patet. Quis autem hic *Saturnalis*, quæve hæc *Natula* fuerit, æque mihi ignotum est, ac quod ignotissimum. Habet nihilominus Inscriptio non pauca, quæ notatu digna videantur.

Prima tantum A lineam habet transversam; reliquæ omnes *Perpendiculararem*, cruribus interpositam, hunc fere in modum A; quod, Imperio ad occasum vergente, primum in usu fuisse judico. Utut illa res sit, hanc hujusce Literæ formam, alibi quam in hoc Lapide, nondum me vidisse memini. Miror eam omitti & in *Bouterovii* & in Doctissimi *Bernardi* Alphabetis. Raram igitur existimo.

E ter quater hic pro Æ: qua de re vide Commentarium in *Julii Vitalis* (1) Epitaphium. In omni hujus Inscriptionis E, lineæ tres parallelæ, a *perpendiculari* incipientes, sunt & perbreves, & inter se æquales.

Linea 4ta. In utraq; Consonante L L, Lineola, cui *perpendicularis* insitit, est brevissima: hinc videtur *Rhodius* (2) ad *Scribonium Largum*, asseruisse, [*Veteres figura parum diversa Literas I & L finxisse, notissimum est.*]

PAT-RONE. De syllabæ mediæ iniqua divisione, non est ut verba faciamus; cum [*hujusmodi Errorum*, (ut ait *Dausquius* (3) *segetem peramplam habent veteres Inscriptiones.*)]

Eadem fere *Patronæ*, atq; *Patroni* ratio. Impp. *Diocletiano* & *Maximo* A. A. sancitum est, [*neq; Patronæ tuæ obsequiis refragari te fas est:*] quam ad Legem *Gotofredus* [*ut Patrono ita Patronæ debetur obsequium*] (4.)

MERENTISSINE pro MERENTISSIMÆ. Min N *μελαστοιχεισταί*. (5) *Prisciani* Sententia M mutatur in N; potissime C. D. T. vel Q. sequentibus: (ut in *Anceps*, *Eundem*, *Identidem*, *Tanquam*.) Sed, ut quod verum esse suspicor, agnoscam, Operarii hoc erratum esse judico, Literam N, nuperrime sculptam, oscitanter iterantis.

Nomen hoc est *Participiale*, maxime in Lapidibus usurpatum. Sic *Gruterus* (6.)

REGIVS ARISTIVS PRIMITIVVS ARISTIÆ FILETINI PATRONÆ BENEMERENTISSIMÆ ET REGIVS HERMES VXORI MERENTISSIMÆ. P.

Punctorum hujus Inscriptionis incerta ratio est; alia vocabulis integris subjiciuntur, ut in Linea 4ta, alterum gladioli, alterum H dimidiatæ formam habens, sic H: tertium triangulare, in fine lineæ tertiæ, post syllabam C A; sed omnino nimium.

De Foliis, quæ in Lapidibus cum Epitaphiis incidi solent, olim à me (7) post alios dictum. Hic autem observatu dignum est, Herbarum folia, quæ cum Epitaphiis ut Humanæ imbecillitatis indicia adhibentur,

(1) Pag. 138. (2) Pag. 307. (3) *Orthographicorum* Vol. I. p. 157. (4) *Cod. lib. VI. Tit. VI. Leg. 8.* (5) *Lib. I. Ed. Putschian.* (6) Pag. 932. n. 7. (7) *Comment. in Julij Vitalis Epitaphium*, p. 187.



non ea de causa hic præstari: hic, inquam, ubi nihil nisi animum beneficiis obligatum, & lætitia plenum, ostendit Lapis. Idem mea sententia dicendum de foliis, quæ in (8) *Longinorum* Altari, quæq; in Altari quod *M. Aurelio* (9) *Antonino* dicatum fuit, incidebantur. Hæc igitur mera ornamenta cœlatoris ingenio deberi cogitandum est.

*Camilii* nomen a *Patrona Camilia Saturnalem* accepisse, dixi; quod *Romanorum* more factum est. Hac de re (10) *Lipsius* [*Idem* (servi) *manumissi*, in nomina *Dominorum* veniebant, cognomine excepto: loco cognominis vetus suum nomen retinebant, ut *Marcus Tullius*, *Tyro*: *Ciceronis Libertus*.]

[*Libertus*, affirmante *Paulo J. C.* (11) *inestimabilis res est*.] [*Nihil* (12) *ea gratius servo præstare potest*.] Patroni, qui servos manumiserunt, & ex justa servitute eos solverunt, quasi *Patres*, qui a morte in vitam illos revocarunt, (13) appellabantur. *Grandi hoc Beneficio* (sic ab (14) *Ulpiano* dictum est) à Patronâ decoratus *Saturnalis*, grati erga eam animi monumentum fecit, & marmore, omne ævum duraturo, merentissimas ejus laudes celebravit.

Plate 12.  
A Roman Inscription dug  
in the North  
of England,  
with Remarks,  
by Dr. Hunter  
n. 354. p. 701.

XXXIV. 1. The Inscription (*Fig. 2.*) was dug up two Years ago in the *Roman Castrum* near *Lancaster*; 'tis very legible, wherefore a search after the first fortifying the Place may not be unnecessary; being able to find the time of *Gordian's* repairing this Fortress to A. C. 243. We may ascribe its Foundation to the prudent Administration of *Julius Agricola*, about 169 Years before. I begin my Enquiry with *Vespasian's* first Appearance in *Britain*.

A. D. 44. the Romans invaded *Britain*, under the Command of *A. Plautius*, in which Expedition *Vespasian*, then Legate of the second Legion, made a glorious Figure, having been in 30 Battles, and reduc'd two powerful Provinces, above 20 Towns, and the Isle of *Wight*. All these Successes could not frighten the Natives into submission, till A. D. 70. *Vespasian* then on the Throne, resolv'd to push on his Conquests in *Britain*, and constituted *Julius Agricola*, Legate of the XXth Legion, who bore a considerable share in the Successes against the *Brigantes*; (15) " Sed  
" primo *Cerealis* modò labores & discrimina, mox & gloriam communi-  
" cabat: Sæpe parti Exercitûs in experimentum, aliquando majoribus  
" copiis ex eventu præfecit. *Tacitus* afterwards in a few Words sums up  
the Whole of *Cerealis* his Acquisitions, (16) " Terrorem statim intulit  
" *Petilius Cerealis*, *Brigantum* Civitatem, quæ numerosissima Provinciæ  
" totius perhibetur, aggressus; multa prælia, & aliquando non incruen-  
" ta; magnamque *Brigantum* partem aut victoriâ amplexus, aut bello.

(8) V. *Camdeni Britanniam Anglice*, p. 570, a Cl. *Gibsono* editam. (9) V. eandem, p. 602. Iterumq; p. 852. (10) V. *Justi Lipsii Tractatum peculiarem*, [*Dè Nominibus veterum Romanorum*] Cap. II. (11) D. de diversis Regulis Juris. L. 106. (12) D. de Fideicom. Libert. Leg. 39. (13) *Lexicon Juridicum Joh. Calvinii*; voce *Liberti*. (14) D. de Bonis Libertorum, Leg. 1. (15) *Tacit. Vit. Agric.* 8. (16) Cap. 17.



Notwithstanding these Advantages, I dare not suppose the *Romans* to have then penetrated so far into this Province as our *Longovicum*, which is situate so near the Northern Bounds of the *Brigantes*, that at present it's not distant above twelve Miles from *Corbridge*, the Roman *Curia*, the chief Town of the adjoining People the *Otadini*. I now advance to my principal Motive, to fix upon the second Year of *Julius Agricola's* Government for this Work, which *Tacitus* \* thus describes, \* Cap. 20.

“ Sed ubi *Æstas* advenit, contracto Exercitu — loca Castris ipse capere,  
 “ æstuaria ac sylvas ipse prætentare: & nihil interim apud Hostes quie-  
 “ tum pati, quo minus subitis Excursibus popularetur; atque ubi satis  
 “ terruerat, parcendo rursus irritamenta Pacis ostentare. Quibus rebus  
 “ multæ Civitates, quæ in illum diem ex æquo egerant, datis Obsidibus  
 “ iram posuere, & Præfidiis Castellisque circumdatæ, tantâ ratione cu-  
 “ râque, ut nulla antè Britannia nova pars illaceffita transierit. This ex-  
 cellent Conduct *Tacitus* further confirms from the Observation of Others.  
 “ Adnotabant periti, non alium Ducem Opportunitates locorum sapien-  
 “ tius legisse, nullum ab *Agricolâ* positum Castellum aut vi Hostium ex-  
 “ pugnatum, aut pactione aut fugâ desertum.

*Agricola*, this Summer, having quieted so large a Tract, and finished so many Fortresses, it cannot be expected all would be built with the most exquisite Art, sufficient to perpetuate them. I proceed to *Gordian's* Repairs; whose Historian *Julius Capitolinus* having never once named *Britain*, yet giving so many Hints of the excellent Oeconomy of his Government, under the prudent Administration of his Father-in-Law *Misitheus*, I dare not fix this Work till the third Year of his Reign: He having before been under the Direction of the Eunuchs and Officers of the Court, whom *Capitolinus* represents, in *Misitheus* his Letter to *Gordian*, to have prostituted all Employments to their own Covetousness and mercenary Creatures.

2. I shall not in the least dispute or call in question the Time of its Foundation, as fix'd by the Doctor, but begin with the Place where it was discover'd, namely *Langcheſter* or *Lancaster*, in the Bishoprick of *Durham*, which I am, <sup>a</sup> with Dr. *Hunter*, fully persuaded was the *Longovicus*, where the *Notitia Imperii* places the <sup>b</sup> *Numerus Longovicianorum*. This place is seated upon a great Military Way, about 12 Miles distance from *Bincheſter*, and seven from *Ebcheſter*, the one the *Vinovia*, and the other the *Vindomera* of *Antoninus*, as the Correspondence of the Numbers may evince; *Bincheſter* being 19 Roman Miles from *Ebcheſter*, as that is nine from *Corbridge*, the exact Numbers the *Itinerary* gives us between *Vinovia*, *Vindomora*, and *Corſtopitum*. What is very ſtrange is, that the *Itinerary*, which muſt go upon the great Road directly thro' this Town of *Longovicus* betwixt *Vindomora* and *Vinovia*, takes not the leaſt Notice of it, but meaſures the Way at the whole

*Farther Remarks, by Roger Gale, Eſq; n. 357 p. 823.*

<sup>a</sup> *Philosoph. Transf.* No. 266. p. 657. *Abr.* Vol. III. p. 426. <sup>b</sup> *Not. Imp.* fol. 176.



Length and Number of Miles, from the first to the latter of those Stations. If *Longovicus* was founded, as Dr. *Hunter* supposes, so early as the Time of *Julius Agricola*, and if that *Itinerary* was composed by any of the Emperors that bore the Name of *Antoninus*, this Station might have been destroy'd or deserted during the Wars with the *Britains*, and not being repair'd till the Reign of *Gordian III.* was pass'd over by the Author of the *Itinerary*, as a Camp not then in being, or of no use to the *Roman* Armies; and this would be no weak Argument for the Antiquity of that work: And perhaps some Parts of it may have been described as early as the Reigns of those Emperors, or earlier, and such Names of more modern Places as are found in it, may have been afterwards added as Occasion required. As a farther Confirmation of this Conjecture, I beg leave to observe, that this Place, after it was repair'd by *Gordian*, subsisted even to the Ruine of the *Roman* Empire in *Britain*, as is evident by the Mention of it in the *Notitia Imperii*; so that had this<sup>d</sup> Journey which carries us from *Vindomora* to *Vinovia* been compos'd after the Reign of *Gordian*, it would be very hard to account for the Omission of this remarkable Station and Town, as it appears to have been from this, and many other Inscriptions found there.

Having this opportunity of doing it, I am unwilling to let it slip without rectifying a Mistake in the *Essay towards the Recovery of the Roman Highways thro' Britain*, printed in the 6th Volume of Mr. *Hearne's Itinerary of Leland*<sup>e</sup>, which having brought the *Ermingstreet* (not the *Watlingstreet*, as Dr. *Hunter* and the Country call it) a little beyond *Cat-tarick* in *Yorkshire*, divides it there into two Branches, tracing one of them to *Tinmouth*, and the other to *Carlisle*, but omits the main Stem of it, that runs almost directly Northward to *Piercebridge*, so to *Denton*, *Houghton*, *Cinchester*, *Langchester*, *Ebchester*, *Corbridge*, and through the Heart of *Northumberland* into *Scotland*, about a Mile and a half to the West of *Berwick*. It is in several places very intire and fair, especially between *Corbridge* and *Binchester*, the Ridge of it there being for the most part two Yards in Height above the Level of the Soil, no less than eight Yards broad, and all pav'd with Stones, that are as even as if new laid: as I am inform'd by the ingenious Mr. *Warburton*, who has often view'd it.

Having fix'd the Seat of this *Longovicus*, where the Inscription was found, let us consider next what sort of a Place it was; and upon due Enquiry it will appear to have been one of the most ancient and eminent Stations the *Romans* were possess'd of in these Parts. As to its Antiquity, Dr. *Hunter* has made it probable, that we ought to look for it as high as *Julius Agricola's* commanding under *Domitian*, in this Island: As to its Eminency, the Inscription that came last from him to the Society, as

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<sup>e</sup> *Ph. Transf.* No. 354. p. 702. v. *supr.* p. <sup>d</sup> *Iter. I. a Limite Prætor. usq;* <sup>e</sup> P. 111, 114.







IMP. CAES. M. NT. G<sup>o</sup> RDIA  
 N<sup>v</sup> S. P. F. AVG. BALNE<sup>v</sup> M. C<sup>v</sup> M  
 BAS<sup>i</sup> LIC<sup>a</sup>. A. L<sup>o</sup>. IN<sup>s</sup> TRVX<sup>i</sup> T  
 PRE<sup>g</sup> N<sup>v</sup> CIAN<sup>v</sup> M. LE<sup>g</sup>. AVG  
 PR. PR. C<sup>v</sup> R. NT<sup>e</sup>. M. AVR  
 QVIRINO PREC<sup>o</sup> HILGR

II.

IMP. CAESAR. M. ANT<sup>o</sup> N<sup>i</sup> VS  
 G<sup>o</sup> RDIANVS. P. F. AVG.  
 PRINCIPIA. ET. ARMAMEN  
 TARIA. CONI<sup>a</sup> PSA. RE<sup>s</sup> T<sup>i</sup> T<sup>v</sup>  
 IT. PER. MAECI<sup>i</sup> VM. FVSC<sup>v</sup> M. LEG.  
 AVG. PR. PR. C<sup>v</sup> R. ANTE. M. AVR  
 QVIRINO. PR. CH. IL. GOR.



well as several others found there, is an undeniable Evidence of its being a Place of great Consideration; but nothing can put that more out of Dispute than the first which was some Years ago transmitted by the same Hand<sup>f</sup>, which therefore I beg leave to insert here with that which came last from him, and the rather because little or nothing has ever been said upon it, and that they will give great Light one to the other.

The Stone whereon the first is cut has been broke in two, whereby some of the Letters are defaced, however, it may be very well read as follows; the Letters PRE in the fourth Line I take to be a Mistake of the Workman, having seen several Copies, where they are so transcribed; that they should be PER is evident from the fifth Line of the second Inscription.

- I. *Imperator Cæsar Marcus Antoninus Gordianus  
Pius Felix Augustus Balneum cum  
Basilica à solo instruxit  
Per Cneium Lucilianum Legatum Augustalem  
Proprætorem Curante Marco Aurelio  
Quirino Præfecto cohortis primæ Longovicariorum; or rather  
Legionis Gordianæ.*

Plate 13.

The second can be read only after the following manner.

- II. *Imperator Cæsar Marcus Antonius  
Gordianus Pius Felix Augustus  
Principia & Armamentaria  
Conlapsa restituit  
Per Mæciliū Fuscum Legatum  
Augustalem Proprætorem curante Marco Aurelio  
Quirino Præfecto Cohortis primæ Legionis Gordianæ.*

From these two Inscriptions compar'd together, it will be apparent that they were not only erected under the same Emperor, but by the Care of the very same Person *Aurelius Quirinus*, tho' not in the same Year. The Emperor can be no other than *Gordianus* the youngest, or third of that Name; the two former having been slain so very soon after they had assumed the Purple, that it is improbable they should have given any Orders or Commands for the erecting of new, and repairing of ancient Buildings, in so remote a Province as *Britain* was from *Africa*, where they were murder'd after a short joint Reign of scarce seven Weeks.

<sup>f</sup> Phil. Transf. No. 266. Abr. Vol. III. p. 426.



<sup>g</sup> Dr. *Hunter* tells us, that that which was first discover'd (and which I shall therefore always distinguish by the Name of the first) was dug up about a hundred Yards East from a great Square, which had been fortified with a thick, strong Wall, faced with hewen Stone, within which, and without, especially towards the East, are nothing but ruinous Heaps of Stone, and thinks the Lodging of the Garrison only to have been included within those Walls. His Conjecture is very much confirmed by the <sup>h</sup> Account he gives us of the finding the last Inscription within that square Inclosure; so that there seems to have been at this *Longovicus* a large Town, and one of those Camps call'd *Castra stativa*, where the Legions lay in Quarters during the time of Peace and Quiet.

The first Inscription tells us, that the Emperor *Gordian* built the *Balneum* and *Basilica* from the Ground, à *Solo*; whereas, by the second he appears to have been only the Repairer of the *Principia* and *Armamentaria*. Perhaps therefore here might be no Town, till the Romans thought fit to repair their old deserted Camp at this Place, and then the Emperor might also build the *Bath* and Palace for the Residence of the *Proprætor*, when in these Parts of *Britain*; the Word *Basilica* importing both a Palace, and an Edifice for hearing of Causes, and transacting all publick Affairs. As this eminent Building was erected by the Emperor's Command, it is an undeniable Argument of the Splendor of this Town, as are the great Heaps of Rubbish, and Ruines, where this Inscription was found, of its Largeness and Extent.

The second equally puts the being of the *Castrum stativum* out of dispute, when it acquaints us with the Rebuilding of the *Armamentaria* and *Principia* there, that is the *Arcenals* and *Quarters* either of the Legionary Soldiers, that were call'd the *Principes*, or the place where the Eagles and other military Ensigns were kept. It is probable they did not belong to one particular Legion, but to several, as they had occasion to be employ'd here; <sup>i</sup> tho' the *Legio sexta Victrix* seems to have the best Title to them, as being constantly quarter'd in the North; whereas, the <sup>k</sup> *Legio Secunda*, and <sup>l</sup> *Vicesima* were generally garrison'd, the first at *Caerleon* in *Wales* and *Richborough* in *Kent*, and the other at and about *Chester*; so that the <sup>m</sup> Monuments they have left in the North were erected by them, when the Wars, and other Works, as particularly the *Walls* carry'd cross the Island, call'd them thither; which being finish'd, they returned home to their more Southern Quarters, and continu'd in them till commanded abroad upon new Services. I will not pretend to determine when these *Armamentaria* and *Principia* first fell to ruin: perhaps it might be when *Hadrian*, *Lollius Urbicus* and *Severus* had carried their Conquests farther into the Enemies Country, and having built

<sup>g</sup> *Phil. Trans.* No. 266. p. 658. <sup>h</sup> *Phil. Trans.* No. 354. <sup>i</sup> *Ptol. Leg.* VI. *Niceph. Ebor. locat.* <sup>k</sup> *Anton. Itin.* XII. *Not. Imp.* p. 161. <sup>l</sup> *Anton. Itin.* II. <sup>m</sup> *Camd.* p. 835, 920. *Phil. Trans.* No. 260.



those famous *Walls*, the Relicks of which we still see in the Shire of *Sterling* in *Scotland*, and in *Northumberland* and *Cumberland* in *England*, that this Camp might be thought useless the *Roman* Forces being drawn nearer to, and quarter'd upon the Frontiers; and so this Fortrefs abandoned and suffer'd to fall into decay, as the Word *conlapsa* implies: and not that it was destroy'd by any Fire, War, or other Enemy than Age and Neglect.

Tho' the Word *conlapsa* is wrote here with an *N*, there can be no doubt but the Pronunciation of it was as we usually find it spelt, *collapsa*; a certain Argument of the Letter *N*'s being silent in the middle of a Word, before two Consonants especially *NS*, and *NT*, when the *T* was pronounced like an *S*. To omit what<sup>n</sup> *Quintilian* says to this purpose, it is confirm'd by the Absence of that Letter in numberless Inscriptions in *Gruter*, *Reinesius*, &c. and no wonder, since the Workmen in those Days, as well as ours, usually wrote as they spoke their Words. I shall not trouble you with Quotations of any of them to this end, but as a Proof of what I say, only assure you from ocular Inspection and a most accurate Examination, that there is no transverse Line over the Letters *ES* belonging to the Word *FABRI(ESIS* in the Inscription of *IVL VITALI* at *Bath*, whatever has been affirm'd to the contrary, but that the Letter *N* is totally omitted there. You will also pardon my Endeavours, before I leave this Subject, to explain a short Inscription belonging to some of our Countrymen, tho' found at *Amerbach* in *Germany*<sup>o</sup>, since it will be a new Proof of the foregoing Assertion.

III.

NYMPHIS ϕ  
NϕBRITTON  
TRIPVTIEN  
SVB CVRA ϕ  
M ϕ VLPI  
MALCHI ϕ  
▷LEG XXII  
PR ϕ P ϕ F ϕ

*Nymphis.*  
*Numerus Brittonum*  
*Triputiensis, or ———enus*  
*Sub cura*  
*Marci Ulpii*  
*Malchi*  
*Centurionis Leg. 22.*  
*Primigeniæ, Piæ, Felicis.*

There is no Difficulty but in the Word *TRIPVTIEN*, and that will presently vanish if you insert the Letter *N*, and read it *TRIPVNT*, *i.e.* *Tripontienus* or *Tripontiensis*, the Mutation of the *O* and *V* being so frequent, that no body is ignorant of it. This will bring you to *Tripontium*<sup>p</sup> or *Dowbridge* in *Northamptonshire*; tho' that excellent Antiquary *Dr. Battely*<sup>q</sup>, in his *Antiquitates Rutupinæ*, would read it *RIPVTIEN*, and fix'd the Place whence this *Numerus* took its Appellation at *Richborough* in *Kent*.

<sup>n</sup> *Quintil. Instit. Lib. I. c. 7.* <sup>o</sup> *Gruter. p. 93.* <sup>p</sup> *Antonin. Itin. VI.* <sup>q</sup> *p. 21.*



But to return where we left the Camp at *Longovicus*, it will be as difficult to assign a Reason for its being repaired, as it was for its being deserted; unless that the *Proprætors* might judge it advisable about the Time of *Gordian III.* to fix their Residence there, and consequently re-fortify'd the old Camp for their State and Security. And that it was not re-fortify'd upon any sudden Emergency, but for Time and Duration, is evident both from the strong Stone-Works that encompass'd it, and a Body of Forces lying here, even at the Expiration of the *Roman Empire* and Authority in this Island, which from its Continuance in the same Station, had got the Name of the *Longovicarii*<sup>r</sup>. The Person that under the Emperor gave Direction for these Repairs, was *Mæcilius Fuscus*: As *Mæcilius* is a Diminutive of *Mæcius*, it is not unlikely that he was the Son of *Mæcius Fuscus*, who was Consul with *Turpilius Dexter*, *A. D.* 225. in the Reign of *Alexander Severus*: By this Inscription it appears that this *Mæcilius* was the Emperor *Gordian's* Lieutenant here and *Proprætor*; For tho' in *Phil. Transact.* No. 354, by the Inadvertency of the *Engraver*, we read only PR. instead of PR. PR; it is right in the Original, and in the Transcript sent up by Dr. *Hunter*, and accordingly afterwards the Fault is amended. And as the Name of *Fuscus* stands in the same Place in the second as that of *Lucilianus* does in the first, and with the same Adjuncts both before and after, we may fairly conclude he was either his Predecessor or Successor, but which, it is impossible to determine.

And here, perhaps, it may not be amiss to remark, we never meet with a *Legatus Augustalis* in any Inscription in this Island, without the joint Title of *Proprætor*; and <sup>s</sup> *Tacitus* himself either makes them the same Office, or at least unites them in the same Person, when he tells us, *In Britannia P. Ostorium Proprætorem turbidæ res excepere*; and having presently after related the manner of the Fight with the *Iceni*, styles him *Legatus, Quâ pugnâ filius Legati, M. Ostorius, servati civis decus meruit*<sup>t</sup>; and a little after he gives both the same Titles to *A. Didius* the Successor of *Ostorius*.

We are indebted therefore to these two Monuments, not only for the Account they have preserved of the *Roman Arms* and Magnificence at *Longovicus*, but for the indisputable Records of the Names of two *Legates* and *Proprætors* of *Britain*, that would otherwise have been buried in Oblivion, viz. *Cneius Lucilianus* and *Mæcilius Fuscus*: For from *Virius Lupus* (who was *Proprætor* and *Legate* here about the Year 208, under *Severus*, and just before that Emperor's coming into this Island repaired a Bath burnt down at *Lavatræ*, or *Bowes*<sup>v</sup>, in *Yorkshire*) we have no where extant the Name of one of those Officers, till we come to *Nonnius Philippus*, whom I take to have succeeded the last of these; the <sup>w</sup> Stone which

<sup>r</sup> *Notit. Imp.* fol. 176. b.   <sup>s</sup> *Tac. Lib. Ann.* 12. c. 32.   <sup>t</sup> *Ibid.* c. 39.   <sup>v</sup> *Camd.* p. 762. Edit. 1695.   <sup>w</sup> *Camd. Britan.* p. 830.



was found at *Old Carlisle* in *Cumberland*, and has preserv'd his Memory, setting forth that he was *Legate* and *Proprætor* when *Atticus* and *Prætextatus* were *Consuls*, which was *A. D.* 242. the very Year that our *Gordian* went upon his *Persian Expedition*, from which he never return'd. And as that Emperor left *Nonnius Philippus* in that Post, when he march'd into the East, where he was murder'd about two Years after, it is highly probable that he was the last *Proprætor* of his appointing, and consequently, that *Mæcilius Fuscus* was his Predecessor, and the Repairs begun at *Longovicus* before the Year 243<sup>x</sup>. I would not have troubled you with this Inscription, but that it is faultily transcribed in *Camden*, and that I shall have occasion by-and-by to refer to it again, upon a material Point.

IV.

I. O. M.

PRO. SALVTE. IMPERATORIS  
M. ANTONI. GORDIANI. P. F.  
INVICTI. AVG. ET. SABINAE. FVR  
IE. TRANQVILE. CONIVGI. EIVS. TO  
TAQVE. DOMV. DIVIN. EORVM. A  
LA. AVG. GORDIA. OB. VIRTVTEM  
APPELLAT. POSVIT. CVI. PRAEEST  
AIMILIVS. CRISPINVS. PREF  
EQQ. NATVS. IN. PRO. AFRICA DE  
TVSDRO. SVB. CVR. NONNII. PHI  
LIPPI. LEG. AVG. PROPRETO.  
ATTICO. ET. PRETEXTATO COSS.

The Person who had the Care of these Repairs both in Town and Camp, was *Marcus Aurelius Quirinus*, *Præfekt* or Commander of a Company of Foot; another Argument for the *Proprætors* *Lucilianus* and *Fuscus* succeeding immediately one the other, he serving in the same Post under both. I must observe however, that altho' the two first Inscriptions have been cut very near the same time, and by the same Hand, as appears by the Form of the Letters, and Manner of the Abbreviations in each of them, yet the Office that this *Quirinus* bore is something differently express'd in the first from what it is in the second, if they have been accurately transcribed; the First shewing, after *QUIRINO* the Letters *PRE. CoH. I. LG. R.* which, before I had seen the Latter, I was induced to read *Præfektus Cohortis primæ Longovicariorum*, the <sup>y</sup> *Notitia Imperii* placing the *Præfektus numeri Longovicariorum Longovico*. That *Numerus* and *Cohors* were the same thing, <sup>z</sup> *Pancirollus*, in his Notes upon that Book, quotes *St. Chrysostome* to prove, and some others, *Cohors erat qui vocatur Numerus*; but I rather take it to be an indefinite Number of Men, which might comprize several Companies, independent of any Legion. <sup>a</sup> *Vegetius*, speaking of the *Legati Imperatoris*, says, *in quorum*

<sup>x</sup> *Phil. Trans.* No. 354. p. 702. v. supra. <sup>y</sup> Fol. 166. b <sup>z</sup> Fol. 161. b <sup>a</sup> Lib. II. c. 9.  
locum



*locum nunc illustres viros constat Magistros Militum substitutos, à quibus non tantum binæ Legiones, sed plures Numeri gubernantur*; by which it is plain, the *Numeri* were no *Legionary Cohorts*. Neither was the Name so modern as from the *Notitia Imperii* and *Chrysostome* it might appear to be; for we meet with a <sup>b</sup> *Numerus Britonum* upon an Altar found in *Transylvania*, dedicated to the *Nymphs*, when the Emperor *Commodus* and *Glabrio* were *Consuls*, *A. D.* 186. And <sup>c</sup> another *Numerus* upon an Altar erected to *Hercules* for the Prosperity of *Septimius Severus*, when *Lateranus* and *Rufinus* were *Consuls*, *A. D.* 197. But after I had review'd the Letters at the end of the second Inscription, which are plainly transcribed *PR. CoH. I. L. GOR.* I could read them no otherwise than *Præfetto Cohortis primæ Legionis Gordianæ*. *Gordian III.* was so beloved of the *Soldiery*, that several *Legions* complemented him by honouring themselves with his Name, as the <sup>d</sup> *Legio tertia Italica*, which took the Addition of *Gordiana*; and the <sup>e</sup> *Legio decima gemina*, and <sup>f</sup> *Decima tertia gemina* did both give themselves the same Appellation. But which of the *Legions* quartered in this *Island* so stiled it self is not determin'd by this Inscription or any other that I know of. However as the *Legio sexta Victrix* was all along quarter'd in the Northern Parts of this Kingdom (as I observed before) where these Inscriptions were erected, I make no doubt but it was that which call'd it self *Gordiana*, tho' the numeral Distinction of *VI* is omitted, only perhaps for want of Room on the Stone. We find by several Inscriptions in *Camden*, that there was an *Ala* in those Parts which prided it self upon its Valour, and was therefore call'd the *Ala Augusta*; of the many Memorials it has left us of its Title, I shall only mention <sup>g</sup> one found at *Old Carlisle*, and which is the ancientest of them all, by any certainty of Date.

I. O. M.  
AL. AVG. OB  
...RTVT. APPEL. CVI  
PRAEEST. TIB. CL. TIB. F. P.  
LING. N. IVSTINVS.  
PRAEF. FVSCIANO.  
II. SILANO. II. COS.

That is, *Jovi Optimo Maximo, Ala Augusta ob Virtutem appellata, cui præest Tiberius Claudius Tiberii filius, provincia Lingonensi, Justinus præfectus, Fusciano secundò, Silano secundò Consulibus.*

This Altar was dedicated when *Fuscianus* and *Silanus* were the second time *Consuls*, that is, in the Year 188. under the Reign of *Commodus*,

<sup>b</sup> Gruter. p. 94. 2. <sup>c</sup> Id. 46. 9. <sup>d</sup> Velf. Monum. Augusta Vindel. p. 431. <sup>e</sup> Grut. p. 80. <sup>f</sup> Gruter. p. 433. 1. <sup>g</sup> Camd. p. 827.



and fifty Years before our *Gordian* came to the Empire. At the same place was also discover'd the fourth Inscription by me quoted, where we find this same *Ala Augusta* stiling it self also *Gordiana*; from whence I think it is not a little probable that the Legion to which this Wing appertain'd was the *Legio Gordiana* mention'd in the Inscriptions found at *Langchester*; and that Legion to have been the *Legio sexta Victrix*, from the long Continuation of this *Ala Augusta* in these Northern Parts of the Nation, the constant Quarters of that Legion.

XXXV. 1. The following Fragment of an old Inscription is to be seen on the *Wall*, about two Miles West from *Lenercross-Abby*, near the Confines of our two Northernmost Counties. *An old Roman Inscription, by Dr. Jurin. n. 356. p. 813.*

CIVITATE CAT  
VVILLAVA  
ORVM L O [ S  
C D ! Q

2. Here 'tis observable, that the last A of the second Line has a Mark that follows it, not unlike to the last Stroak of an N; and if instead of A/ we put N, we shall read it CIVITATE CATVVILLAVNORUM, which we cannot doubt to have been the true Name of that People which *Dion. Cassius*, *Lib. LX.* calls *Κατσελλανοί*, and *Ptolemy*, in his Geography, *Lib. II. cap. 3.* more falsly, *Κατσεχλανοί*; the first λ by producing the transverse Stroke having been mistaken for χ. This Nation appears by *Dion* to have been more potent than their Neighbours the *Dobuni* (whom he calls *Boduni*) and had, according to *Ptolemy*, *Verolanium* for their Capital, which, 'tis most probable, was the *Cassivellauni oppidum* of *Cæsar*. So that it should seem *Cassivellaunus* King of these *Catuvillauni* when *Cæsar* invaded *Britain*, either gave his Name to his People, or took theirs. But he was no doubt the most potent Prince at that time in *Britain*, since by common Consent of the rest, he was made General of their united Forces, in defence of their Country's Cause against the *Romans*. *Remarks, by ib. p. 814.*

XXXVI. 1. A Person last Week being at Plow in a Close near the Bank of the River *Usk*, which the Ancients called *Isca*, (which glides by us about a quarter of a Mile off and in sight of *Caerleon*) came thwart a Stone; and finding Letters thereon, took it up whole; 'tis about a Yard in length, and about three Quarters broad. I went to the place, and took a true Copy thereof, as follows. There was underneath it some seeming Oblong Square Sepulcher of Stones, rude in order. A little further in that Close, where that River wears out the Land, there was, some time before, a large Earthen Pot taken out of the Bank by the River-side, which had therein the Scull and Bones of some Person, by some

*A Roman Inscription, by Mr. Rice. n. 359. p. 945.*



some thought to be a Child murther'd; But I rather conjecture it a Roman Urn.

D M

G. VALERIVS. G. F.  
GALERIA. VICTOR  
LVGDVNI. SIG. LEG. II AVG  
STIP. XVII. ANNOR XLV. CV  
RA. AGINT. AMNIO. PERPITVO. B

Remarks, by  
Dr. Harris.  
*ib.* p. 946.

2. This ancient and fair Inscription confirms what others have found hereabouts; and what *Camden* and other Historians shew us, viz. That the second Roman Legion called *Augusta*, brought into Britain by *Claudius Cæsar* under the Conduct of *Vespasian*, was placed here by *Isca* or *Caer Legion*, by *Julius Frontinus*, in order to awe the *Silures*: And that General obtained several Victories over them and their Neighbours in several Places hereabouts.

There seems to be nothing of moment or of difficulty in this Inscription; but *Victor Lugduni*: Which as I think we have no ground from History to refer to *Lyons* in *France*, so I guess that Expression may be thus accounted for. The River *Lugg* is famous in the Neighbouring Parts; and as *Dynas* or *Dyn* hath been said to signifie a Town in the Ancient *British* Language; and that *Dun* doth also serve to express a Hill or *Down* as we still call it; (which I think is derived from the *British* also) probably *Lugduni* here may express some Town or Hill near the River *Lugg*; and since there is a Place called to this Day *Luckton*, on the side of the River *Lugg* in *Herefordshire*, perhaps that may bid fair to be the very place where *Valerius* obtained the Victory perpetuated by this Inscription.

Antiquities in  
Lincolnshire,  
communicated  
by Mr. Tho-  
resby. n. 279.  
p. 1158.

XXXVII. 1. Near the River *Welland*, that runs thro' the Town of *Spalding* in *Lincolnshire*, at the depth of above eight or ten Foot, there were found *Jettys*, as they call them, to keep up the old Rivers Bank, and the head of a Tunnel that emptied the Land-water into the old River; and at a considerable distance from the present River, I guess 20 or 30 Yards, there were dug up (about the like depth) several old Boats, which things shew that anciently the River was either much wider than now it is, or ran in another place, or both. On the other viz. the North-West side of the River, and more upwards in the Town,



Town, were digg'd up (at about the aforementioned depth) the remains of old *Tanvats* or *Pits*, a great quantity of *Ox Horns*, and the Shoe-soles, which I told you of, and I think the very Tanners knobs, &c. which things shew, that the surface of the Country lay anciently much lower than now it does, and has been raised by the Seas throwing in its Sand in the Maritime Parts (now most inhabited) and by the *Moor* or *rotted Sedge* in the fenny parts next the high Country; the whole Level is about 50 Miles in length, and 30 Miles over in the broadest parts. No Record (Printed or MS) or Tradition whatsoever, (that I ever heard of) tell us when these Mutations here discoverable happened.

One thing further I will add, that lately at the laying of the present new Sluice or Goat (as they call it) at the end of *Hamorebeck*, at its fall into *Boston* Haven, taking up the Foundation of the old Goat, they met with the *Roots of Trees*, many of them issuing from their several *Boles* or *Trunks*, spread in the Ground, which when they had taken up (Roots and Earth they grew in) they met with a solid Gravelly and Stony Soil of the high Country kind, (but black and discoloured by the change that had befallen it) upon which hard Earth they laid the Foundation of this new Goat. Where these Roots were dug up, was certainly the surface of the old Country, the certain depth whereof I cannot now tell you, but that it was much deeper than that at *Spalding*, as the Land is there at present higher. The *Archimedean* Screw, or Screw-like Trunk or Cylinder, by which the Workmen cleared themselves of Water was very pretty.

2. A Workman being about to fence in a Hay-stack, and digging a grip for that purpose about the depth of half a Yard, struck his Spade upon a Pot, which when he broke, (else nothing could be got out of it) there was no less than 36 pound weight of old *Roman* Copper Coin found in it. The Pieces were found set in rows edgeways one by another, and stuck so together with the Verdigrease or Rust of Copper, that many of them required a Chizel or some such thing to separate them; but being separated, clean'd and brighten'd, the Heads or Figures of all or most of them were very fair, (some as when newly stamped,) and the Inscriptions of many are very legible. Here was amassed together a great variety of Coins in this Pot. The place where they were found is in the midst of the vastest Flat or Level in *England*, and in a Ground that, for many Ages past, used to be cover'd with Water in the Winter, and overgrown with Reed in the Summer. 'Tis about a Mile and a half South by West from *Fleet Church*, and about as far South by East from *Holbeach*. There are no Banks or Hillocks, old Works or Ruins to be seen near it; nor any remains or tokens of any thing extraordinary to have been there; (but the old Sea Bank about two or three Mile off; which *Dugdale* from a passage in *Tacitus* believes to be cast up by the *Roman* Soldiers.) But all is as flat as the Sea, and a low

*A farther Account of the same. ib. 1156.*



Country, producing a coarse flaggy Grass for the most part round about it.

Swedish

Coins, by Mr. Thoresby. n. 297. p. 1901.

XXXVIII. I have a *Swedish Coin*, or rather a square Copper Plate, 9 Inches broad, and 9 and an half long, which is much like the *Roman Æs grave*, and was current there so lately as *An. 1679.* (tho' now they are not to be met with) It has at each corner the Impression of a Crown, under which is the Year, and round it this Inscription, CAROLUS XI. D. G. SVE. GOT. WAN. REX. and in the middle of the Plate in a Circle 2 DALER. SÖ IH. M<sup>ij</sup>t. The other side of the Plate is without any Inscription. Several of the Modern Christian Princes of those Northern Countries, have inscribed the *Nomen Tetragrammaton* of our Almighty *Jehovah* on some of their Monies: I have *een Svenska marc* of *Charles* the 9<sup>th</sup> with it, surrounded with rays of Glory in the midst of the *Area* on the Reverse, and a Mark, half Mark, and a two Mark-piece all of the famous *Gustavus Adolphus*, with the like Characters above the King's Head.

Norman

Coins at York, by the same. n. 303 p. 2127.

XXXIX. Mr. *Samuel Buxton* designing to build upon a Piece of Ground he had bought in *High Ousegate* in *York City*, had Labourers to remove the Rubbish of a former House; which, with about thirty more, was burnt down *April 3. 1694.* In digging below the Foundations of the former House, at a considerable depth they discovered the more ancient Foundations of an old Fabrick, very probably unknown to the Builders of the later House. These lower Foundations were very well supported at several Angles with good Oak Piles, some of which were so firm and sound, that they were good again for the same purpose; besides these Piles, there were several great Timber-trees, that lay athwart, to make the stronger Foundation: Betwixt the head of two Piles in this lower Foundation, the Workmen found a little decay'd Oak-box, wherein had been hoarded about 200 or 300 Pieces of *Norman Coins*; but age and the moisture of the place had so defaced them, that not above 100 of them could be preserved: Through the Gentleman's kindness I had the perusal of about half that number, which proved the noblest stock that ever I saw, or indeed heard of, of *William the Conqueror's* Coins; not above two or three in the whole Cargo that I saw being of any other Prince: Those, tho' later in time, are more rare in value than many of the *Roman* and *Saxon Coins*: these lower Foundations also very well answer the account we have of the *Timber-buildings* in those Ages. The Coins are very much alike; the King is represented full-faced, with a Crown and Labels, but neither Scepter, Cross or Star, as in other Moneys of his that I had before; most of them are inscribed *WILLELMVS REX*, which some have mistaken for *William the II<sup>d</sup>*; but by the declining of the strokes, it appears to be design'd for *V*, as I have one with the *S* after the *V* and before *REX*. By this accident there appears greater



variety, than ever was known before, of the Conqueror's Money, thro' the kindness of Mr. *Buxton* and others. I have of these sorts, *WILLEMV REX. WILLEMVS REX. WILLEMV REX I.* (which is not to be reckoned a Numeral Letter, it being improper to pretend a distinction, when there was none of the Name before, but for part of the Letter *A*) *WILEM REX A. (Angliæ.)* And for the Reverse I have that were coin'd at *LUNDRE. (London.) Eoferwick. (York.) WINC (Winchesler.) EXETE (Exeter.) LIN (Lincoln, I presume, Lyn-Regis not being old enough.) LINCOL (Lincoln.) DEOTFORND (Thetford.)* and *LOYNC* (which I take for *Loyn* or *Lancaster*). I have only one duplicate, which I present to you, and hope you will find it safe in the Seal of the Letter; 'tis inscribed  $\times$  *WILLEMV REX I.* Reverse  $\times$  *DEII. IRD ON LIN.*

XL. They were dug up at the East Entrance of *Clifton* (a Village Roman ones, on the Cliff of the Hill) three Miles from *Doncaster*, the *Roman Danum*, by the same.n. 303. p. 2149. where the *Præfectus Equitum Crispianorum* resided, and one from *Cunsbrough* or *Coningsburgh*, an ancient Seat of the Kings during the *Saxon* Heptarchy, now belonging to Mr. *Cook* of *Norfolk*. They were found so near a Highway, that the Cart-tracks had worn the Earth off the top of the *Urn*, which a Labourer of Mr. *Molesworth's* struck his Pick-Ax into, before he was aware of it: Upon another search they found another *Theca Nummaria*, both full of Copper-Coins; the haste and scramble of the Workmen made them break in pieces both the Urns, which werẽ large and entire; the bigger of them might contain two Gallons: By the Fragments of them they appear to have been of a finer Clay than those found at \* *South Holland* in *Lincolnshire*, and the Coins also much better preserved, being in a drier Soil. Of 60 I bought of those found at *Fleet* \* Phil. Trans. n. 279. p. 1156. sup. p. 129. Com. *Linc.* there was not one before *Gallienus*, nor after *Quintillus*; and of near 150 of these from *Clifton*, there is not one of an elder, or later date; so that both those in *Holland* and these in *Yorkshire*, seem to have been hid in some common Calamity that followed the Death of that short-liv'd Emperor *Quintillus*, who reigned but seventeen Days, *An. Dom. 271.* And within six Years after, we find that *Probus* the Emperor, upon some Commotions in *Britain*, sent over certain *Vandals* and *Burgundians*, who had invaded *Gaul*, to inhabit *Britain*; upon whose arrival, probably such as had made the Insurrection, might conceal their Treasure; and being slain in the Conflict, it lay hid till now. This I look upon as a more probable Conjecture, than the Persecution of *Dio-clesian*, which was not till thirty four Years after. These, tho' they have not added one Emperor to my Collection, yet have they made a very considerable addition to the Variety of Reverses; so that I have above thirty of *Gallienus*. I shall only present you with a List of such as were found at *Clifton*. So far as are in Capital Letters are upon the Coins, the rest are only for explanation.



Reverses of *Gallienus*. SECVRITAS PERPETUA. PAX AVGVSTI. APOLLINI CONSERVATORI AVGVSTI. PVDICITIA. LAETITIA. AEQVITAS AVG. AETERNITAS AVG.

LIBERO Patri CONS. AVG. DIANAЕ CONS. AVG. MARTI PACIFERO. .... P. VII. COS. (Pietas libans) .... S. STATOR; which I take for *Mars*, who is sometimes so stiled as well as *Jupiter*. VICTORIA AETERNA. CONCORDIA.

*Salonina*. Reverse VESTA.

*Posthumus*. PAX AVG. P. M. TRP. COS. V. which I take to be remarkable, having not met with any more than the fourth Consulship.

*Victorinus*. INVICTUS (typus Solis vel Apollinis) VIRTUS AVG. PAX AVG. SALVS AVG. PIETAS AVG.

*Tetricus* the Father. SALVS AVG. PAX AVG. HILARITAS AVG. VICTORIA AVG. FIDES MILITVM. LAETITIA AVG. SPES PVBLICA. COMES. VIRTUS AVG. COMES AVG.

*Tetricus Caesar*. SPES PVBLICA. SPES AVGG. PIETAS AVGGUSTORVM.

*Claudius*. GENIVS EXERCI. LIBERALITAS AVG. VIRTUS AVG. VICTORIA AVG. PAX AVG. FELICITAS TEMPORIS. AEQVITAS AVG. IOVI VICTORI.

*Quintillus*. PROVIDENTIA AVG. VIRTUS AVG.

Others, by the same. n. 316. p. 134.  
\* Phil. Trans. n. 282. n. 1288. sup. p. 49.

XLI. In April 1718, some Roman Coins were plow'd up in Cookridge in Yorkshire, and are a confirmation of the Conjecture of the late \* *Thomas Kirk, Esq*; that the Roman *Via Vicinalis* (which comes from the great military Road upon *Bramham Moor*) pass'd from the Station at *Adellocum* thro' these Grounds to *Ilkley*.

There are but few of them but those mostly very fair; The eldest is of *Domitian*, A. U. C. 846. or A. C. 95. His Head is surrounded with this Inscription, IMPERATOR CAESAR DOMITIANUS AVGVSTUS GERMANICUS P. M. (Pontifex Maximus) T R. P. (Tribunitia Potestate) XIII. The Reverse shews he was then saluted Emperor the 22d time, IMP. XXII. COS (Consul) XVI CENS. PP. (Pater Patriæ,) the *Flavian* Family particularly affected the Title of *Censors*, and *Domitian* is the last Emperor who has that Title upon his Medals; the Figure upon this Reverse has a Helmet upon the Head, and a Spear in the Right Hand.

The next is of *Nerva's*,

IMP. NERVA. CAES. AUG. PM. TRP. COS. Reverse CONCORDIA EXERCITVVM. Dextræ junctæ.

The next Seven are of *Trajan's*, but all different,

IMP. CAES. NERVA. TRAIANVS. GERM. Rev. PM. TRP. COS. III. PP. figura stolata stans, sinistra cornucopiæ.

The



The next has the same Inscription, save that it was in his 4th Consulship, and has *figura galeata cum hasta*.

IMP. TRAIANO. AUG. GER. DAC. PM. TRP. Rev. COS. V PP. SPQR. (Senatus Populusque Romanus) OPTIMO PRINCipi. Pacis stantis typus, dextra facem admoventis spoliis, ea conflagaturus, sinistra cornucopiæ tenentis. (exurge) PAX.

IMP. CAES. NER. TRAIANO. OPTIMO. AVG. GER. DACico. Rev. PM. TRP. COS. VI. PP. SPQR. Deus Genius stans, dextra pateram.

IMP. TRAIANVS. AVG. GER. DAC. PM. TRP. Rev. COS. VI. SPQR. OPTIMO. PRINC. fig. stolata.

IMP. TRAIANO. OPTIMO. AVG. GER. DAC. PM. TR. PP. Rev. COS. VI. PP. SPQR. figura stolata dextera Caduceum, sinistra Cornucopiæ.

IMP. TRAIANO. AVG. GER. DAC. PM. TRP. COS. VI. P.P. Rev. SPQR. OPTIMO. PRINCIPI. Columna cochlidis *Trajani*.

The rest that are legible, are of *Hadrian's*, viz.

HADRIANVS. AVGVSTVS. Rev. COS. III. Victoria cum Palma.

The other has upon the Reverse,

FELICITATI. AVGVSTI. Above the *Navis Prætoria*, and below it COS. III. PP.

These are all of Silver: There was a large one of Copper of the Emperor *Domitian*,

IMP. CAES. DOMIT. AVG. GERM. . . . but the Reverse was not legible.

*John Dyneley* of *Bramhope* Esq; has also three, one with FIDES EXERCITVVM, one of *Titus's*, and one of *Trajan's*, with *Dacia* Captive under a Trophy, but I want the Inscription; all the rest are in the Possession of *Cyril Arthington* of *Arthington* Esq; the Lord of the Manor, who obliged me with one, for Lecturing upon the rest, the Figure whereof I send you, it being upon a remarkable Occasion, and not mentioned in *Occo* (at least in my Edition of that Author;) 'tis inscribed HADRIANVS AVG. COS. III. PP. Rev. RESTITVTORI HISPANIÆ. This was upon his peaceable settling of Affairs in that his Native Country; *Spain* is represented here as a Woman with a Branch in her Right Hand to denote her Fruitfulness, kneeling before the Emperor, who kindly takes her by the Hand to raise her up.

Plate 12.  
Fig. 3.

By these it appears this Station flourish'd, when the *Roman* Empire was in its prime, and there being none of a later date, makes it probable, that



it perish'd in some of the Insurrections of the native Brigantes, as it was conjectur'd from the Form of the Letter A in the Inscriptions on the Funeral Monuments formerly accounted for.

XLII. *Accounts of Books omitted.*

- n. 302 p. 1101. 1. *Nεχρονηδεία*: Or the Art of Embalming. Part I. With a Map and fourteen Sculptures, by *Thomas Greenhill*, Surgeon. 4to. *Lond.* 1705.
- n. 337. p. 283. 2. *Julii Vitalis Epitaphium*: cum Notis Criticis Explicationeq; V. C. *Hen. Dodwelli* & *Commentario Gul. Musgrave*, M. D. *Isæ Dunmon.* 1711.
- n. 344. p. 304. 3. *Ducatus Leodiensis*: Or the Topography of the Town and Parish of *Leedes*, and Places adjacent in the County of *York*, by *Ralph Thoresby*, Esq; *Fol. Lond.* 1715.
- n. 346. p. 385. 4. *Geta Britannicus. Accedit Domus Severianæ Synopsis Chronologica, & de Icuncula quondam M. Regis Alfredi Dissertatio*, 8vo. *Isæ Dunmon.* 1715. Auctore *Gul. Musgrave*, M. D. R. S. S.
- n. 349. p. 502. 5. *Dissertatio de Dea salute*; In qua illius Symbola, Tempia, Statuæ, Nummi, Inscriptiones exhibentur, illustrantur. Auctore *Gul. Musgrave*, G. F. *Oxon.* 1716.
- n. 300 p. 2012. 6. *Olavi Rudbeckii Atlanticæ, sive Manhemii pars Secunda*. In qua solis, Lunæ & Terræ cultus describuntur, omnisq; adeo Superstitionis hujusce Origo, parti Sueoniæ Septentrionali, Terræ puta Cimmeriorum, vindicatur, ex qua deinceps in orbem reliquum divulgata est, &c. Accedunt Demonstrationes certissimæ, quæ Septentrionales nostros, in maxime genuinum Solis ac Lunæ motum, indeq; pendentem accuratissimam temporum rationem, multo & prius & felicius quam gentem aliam ullam penetrasse declarant. *Upsalæ. Folio.*
- n. 301. p. 2057. 7. *Ejusdem Pars Tertia*. In qua vetustissima majorum nostrorum Atlantidum lapidibus, fago, æri, sive cortici Runas suas incidendi ratio, unâ cum tempore, quo illa primum cœperit, exponitur. Necnon aurei numeri singulis annis tributi, & signorum Cœlestium, quæ abhinc ad Græcos & Latinos sunt translata, verâ origo & significatio traditur. Et illæ a diluvio Noachi primæ ætates, atq; in illis prima Atlantidum nostrorum forma, describuntur: quæ migrationes & bella, sub Boreo seu Saturno ejusq; filio Thoro seu Jove, gesta recensentur: & deniq; Scytharum Phœnicum & Amazonum, his ducibus in Indo-Scythiam seu Phœniciam seu Palæstinam è Sueonia factæ expeditiones enarrantur. Quibus omnibus Mythologiæ per plures, quarum sensus in hunc usq; diem incognitus hic demum detectus prodit, jucundæ sane & perquam utiles adjunguntur. *Upsalæ. Fol.* 1698.



## C H A P. II.

*Voyages and Travels.*

I. **A** Nno 1673, I was presented to the Vicarage of *Sheriffe-Hales*, and also to the Rectory of *Kinnardsey*, the former in the Counties of *Salop* and *Staffordshire*: The other wholly in *Shropshire*. Nov. 6. I was inducted into the Parsonage of *Kinnardsey*, where I was Incumbent for thirty Years and upwards; at my Induction I found a great many *Aged People* in the Parish, upon which I took the Number of the Inhabitants, and found that *every sixth Soul was sixty Years of Age*, and upwards, some were eighty five and some ninety; this I could not but wonder at, considering that the Town was surrounded with a large Morass, overflowed in Winter, and that you could not come into the Parish any way upon Arable Land. At my Entrance there, I found neither *Gentleman* nor *Beggar*, nor any sort of *Dissenter* from the Church; there had been no *Law Suit* amongst them in the Memory of Man, nor was any commenced during my Incumbency as Rector there for above thirty Years together; they have but *one way to the Town and Parish*, the rest they hire from Lords of the adjacent Manors. The *Morasses* or *Moors* are of great extent, and the Parish was surrounded with them, the Village was called *Kinnardsey* or *Kinnardus his Island*; *ei, ea, ey*, all these are watry Terminations: Thus the next Parish was *Eyton*, the Town upon the Waters, *Edney*, or *Edwyney*, *Edwin's Island*, *Buttery*, or *Butterey*, the Island of Butter, being a long grazing Tract of Land, with some others of the like ending. All that vast Morass was called, the *Weald-Moor*, or the Wild Moor, that is, the Woody Moor: Thus the *Wood-Lands* of *Kent* are called the *Weald* of *Kent*; the *Wolds* of *Yorkshire* most probably have been Woody formerly, and called the *Wealds*, for the word *Weald* or *Wold* is by our *Saxon* Masters render'd *Woody*; and I have been assured from aged People, that all the Wild Moors were formerly so far overgrown by Rubbish Wood, such as Alders, Willoughs, Salleys, Thorns, and the like, that the Inhabitants commonly hang'd Bells about the Necks of their Cows, that they might the more easily find them. These Moors seem to be nothing else but a Composition of such Sludge and Refuse as the Floods left upon the Surface of the Ground, when they drain'd away, and yet this Sediment is full three or four Foot thick; for I have often observed, that the Black Soil cast up by Moles, or digged out of the Ditches, was a meer Composition of Roots, Leaves, Fibres, Spray of Wood, such as the Water had brought, and left behind it; in digging they often find Roots and Stumps of Oaks three or four Foot under the Surface, and they are very common in the bottom of their Ditches and Drains: The Soil is peaty, and cut up for Fewel in some part of the other

*Observations in Shropshire, by Mr. Plaxton, com. by Mr. Thoresby. n. 310. p. 2418.*



Lordship ; in the bottom of these Peat Pits, they find Clay, Sand, and other sorts of Earth. These Grounds have been formerly much higher, for I have observed Oaks and other Trees, where the present Soil is so much shrunk and settled from them, that they stand upon high Stilts, and are supported from the great Fibres of the Roots, so that Sheep may easily creep under them.

That great Tract, called formerly *Vasta Regalis*, is now by Draining become good Pastorage, and yields my Lord Gower, the Owner of it, a considerable Rent, his Ancestors having purchased the Royalty from one of the Earls of *Shrewsbury*: It yields great Quantities of Hay, tho' much of it is of such a nature, that it will dry up a new Milch-Cow, starve an Horse, yet will it feed an Oxe to admiration; and I have heard some Grasers say, they could not by their best Upland Hay feed an Oxe so fat, as the Moor-Hay would do; this, I suppose, proceeded from its dry and binding Quality that made the Oxen drink much.

One thing I must further observe to you. Within the Parish, about half a Mile from the Church, there is a pretty Farm call'd, *The Wall*, which I judge was formerly a *British Fortification*; 'tis encompassed with a Morass, and raised up from Sand, broken Stones, Gravel, and Rubbish to a great height and breadth, being (as I measured it) above 1900 Yards in compass, and 16, 18, and 20 Yards in breadth: In some places it seems to have been built before the Moors became boggy, for I could never find any way over the Moors, by which they could carry those vast Quantities of Earth, Clay, Sand and Rubbish to raise that mighty Rampire. In that Parish I was the *sixth Rector* from the Days of *Henry VIII*.

As to my Rectory of *Donington*, to which I was presented *Anno 1690*, I found there as many *Old People* as I did at *Kinnardsey*, nay, I may say more; and in the two Parishes I had but a difference of three in the Number of the People; at *Kinnardsey* I had 135 Souls, at *Donington* 138; of the 135 I had 23 aged 60 and upwards, of the 138, 24; both which Numbers multiplied by 6, the one at *Kinnardsey* was 138, the other at *Donington* would have been 144. I had nothing very remarkable at *Donington*, save the *Royal Oak*, which stood at *Boscobel* within the Parish, and the Owners thereof paid 6s. 6d. yearly, in lieu of their Tythes and Offerings: The *Royal Oak* was a fair spread thriving Tree, the Boughs of it were all lined and covered with Ivy; here in the Thick of these Boughs the King sat in the Day-time with Colonel *Carless*, and in the Night lodged in *Boscobel-House*, so that they are strangely mistaken, who judged it an old hollow Oak, whereas it was a gay and flourishing Tree, surrounded with a great many more; and as I remember in Mr. *Evelyn's* History of Medals, you have one of King *James I.* or King *Charles I.* where there is a fine spread Oak with this Epigraph, *Seris Nepotibus Umbra*; which I leave to your Thoughts. The People here live to great Ages; I saw in one House three healthful People, whose Ages numbred together



together made 278, and I think they lived some Years after; they were the Man and his Wife, and his Wife's Brother.

I was at *Donington* about thirteen Years and some Months; in all that time I buried but twenty seven People, of which Number four came from Neighbouring Parishes, four were young ones, and of the remaining nineteen, the youngest was about sixty, and the eldest ninety six Years of Age. I was there the fourth legal Incumbent in Succession from the *Reformation*; and as I remember at one Triennial Visitation of the Bishop, we had neither Burial or Wedding to return into the Registry at *Litchfield*: The Country is very healthful in those Parts, and tho' it seems to the Eye of a Traveller to be but of a moderate height, yet in riding between *Donington* and *Wolver-Hampton*, which is but five Miles, you cross four Rills or Brooks in the compass of three Miles, two of which run into the South-West Seas, viz. to *Severn* and *Bristol*, the other two hasten to *Trent* and *Humber*, and so into the Northern Ocean. The poor Remains of the *Royal Oak* are now fenced in by an handsome Brick-Wall, at the Charge of *Bazil Fitz-Herbert* Esq; with this Inscription over the Gate, (upon a Blue Stone) in Golden Letters.

*Fœlicissimam Arborem quam in Asylum  
Potentissimi Regis Caroli Secundi Deus Opt. Max.  
per quem Reges Regnant, hic crescere  
voluit, tam in perpetuam rei tantæ  
Memoriam, quam in Specimen Firmæ  
in Regis fidei, Muro cinctam  
Posteris Commendant, Bazillius  
& Jana Fitz-Herbert.  
Quercus Amica Jovi.*

'Twas put up about twenty or thirty Years ago, but the Place deserved a nobler Memorial; I have writ it in such Lines as they have cut it, and as the Letters now stand; a few Years will ruin both the Wall and the Inscription.

The Emblematick Medal my good Friend alludes to, is the XLVI<sup>th</sup> in Mr. *Evelyn's Numismata*, which King *Charles I.* caused to be stamped in honour of the Installation of his Son, whereupon is the *Royal Oak* under a Prince's Coronet, overspreading Subnascent Trees and young Suckers.

SERIS. FACTURA. NEPOTIBUS. UMBRA.

Reverse within the Garter of the Order is this Legend.

CAROL. M. B. REGIS FILIUS. CAROL. PRINC. INAUGURATUR XXII. MAII. MDCXXXIIX.

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The



The Inscription at *Boscobel* reminds me of one I had from the late Reverend Mr. *Illingworth*, President of *Emanuel College, Cambridge*, which was inscrib'd on a Pillar erected by the Sea side.

*Siste, viator, iter; vestigia prima secundus  
Posuit hic Carolus, quum redit exilio.*

Observables in  
Wales, by Mr.  
Edw. Lhwyd.  
n. 334. p. 462.

\* Phil. Trans.  
n. 201. p. 778.  
Abr. Vol. II.  
p. 466.

II. 1. I searched diligently in *Snowdon Hills* for figured Stones; but met with none at all, except cubical *Marchasites*, and *Crystals*, whereof I found one about nine Inches long, and thicker than my Wrist, transparent as *Glass* for the better half, but opaque towards the Root like white *Marble*. Some small ones I met with of the colour of a *Topaz*; and was inform'd of others purely *Amethystine*, found in the Valley of *Nant Phrantcon*. I find our Ancestors (for want of more precious Stones) made themselves Beads of Opaque, or *Marble Crystal*; for I have one given me, cut like a *Lottery-ball*, and perforated; found not long since in *Meirionydhshire*. I desire to know whether you are satisfy'd, that those transparent Stones figured by *Dr. Plot*, and by *Dr. \* Lister*, by the name of *Ombriae*, &c. are so form'd naturally. One of them was lately given me (set in *Copper* with a little Handle to it) by the name of *Tlws Owen Kyveiliog*, i. e. *Owen of Kyveiliog's Jewel*; so call'd, because found in an old *Grigg* or *Barrow*, near the Place where he lived.

*Sir William Williams* hath several *Welsh MSS.* (tho' I think no *Dictionary*.) They are chiefly modern Copies out of *Hengwrt Study* in *Meirionydhshire*, which I am promis'd free access to; and have this time taken a Catalogue of all the ancient MSS. it contains. They are the Works of *Taliesyn*, *Aneuryn gwawdydh*, *Myrdhyn ab Morvryn*, and *Kygodio*, *Elaeth*, who lived in the fifth and sixth Centuries (but the small MS. containing them all seems to have been copied about 500 Years ago) as also of several others valuable in their kind.

We have neither the *Ibex* nor *Rupicapra* in *Wales*, nor any other Goat but the common. In our Language the Park Deer is call'd *Geivr Danas*: The former word signifies *Goats*, but whether the latter part implies *Danish* (as if Deer had come from *Denmark*) or somewhat else we know not.

The *Grey Game* (tho' I have not heard of the name) seems to be the Female of the *Black*; which we call *Gryg-ieir*, i. e. *Gallinæ ericetorum*. The *Red Game* we call *ieir y mynydh*, i. e. *Gallinula montanæ*; because in our Country they keep to the highest Hills, or Alps, [in *Welsh banneu*,] especially if heathy. There came this last *May* into *Cardiganshire* two strange Birds (as I guess by the Description given them) of the *Aquatic fissiped Tribe*. They say they were almost two Yards tall, and of a whitish colour, with the Tips of their Wings dark: I took 'em to be some sort of *Exotic Crane*. This time two Years, there came a

Flock



Flock of Birds [about a hundred] to a Hemp-yard, at a place called *Lhan Dhewi Velfrey* in *Pembrokeshire*; and in one Afternoon destroyed all the Hempseed. They were extraordinary tame; or so intent on their Food, that being forc'd from the Food, they would not remove above two or three Yards. The Cocks were of a deep Scarlet Colour, without any distinction in the Feathers of their Wings, except that the Tail and the lower part of the Belly were a little paler. The Hen had a lovely Scarlet Breast, her Head and Back grey.

Our Lakes (tho' they are very numerous) afford no Fish that I can hear of, besides Trout and Eel, and *Torgoch* and *Gwiniad*, i. e. Shelley and Charre. A Fisherman protested to me, that in a Lake called *Lhyn y Cwn* near *Lhan Berys*, he had several times catch'd Monocular Trouts, somewhat distorted or contracted awry. They farther assured me, that the two highest Lakes of *Snowdon* (*Phynnon Vrech* and *Phynnon Iâs*) afford no Fish at all; and that the Trouts of the other Lakes differ in colour: But these things must, and shall (God willing) be better inquired into.

There is no Brimstone or Pumice-stones on the Tops of our Mountains, nor any thing else that I suspect to have been the Effects of Vulcanos's. What seemed to me most strange, were waste confus'd Stones, and (to appearance) fragments of Rocks, standing on the Surface of the Earth, not only in wide Plains, but on the Summits also of the highest Mountains. I have never seen any Lake or Spring on the Summit of a Hill. There are indeed on the tops of some Hills, where stood anciently Castles or Forts, certain Wells called in Welsh *Pydew*; a Word of the same Signification as well as found with the Latin *Puteus*: But no Water runs out of these; and several of them I found quite dry.

I saw some new Species of *Glossopetræ* and *Siliquastra* (the first *Ichthyodontes*, I suppose, that ever were observ'd in *Wales*) on the top of a high Mountain called *Blorens* near *Aber Gavenni*. The *Siliquastra* were smaller than the generality of those I had observ'd in other Countries. Of the *Glossopetræ* we found one pretty large; but the rest very small; all black, or atrorubent. The same place afforded also some variety of Fossil Shells, and plenty of *Cuthbert's* Beads, which were very small in comparison of what are found throughout the North of *England*. We also found there a large Testaceous Body, not to be compar'd as to its Figure with any sort of Shell yet describ'd: Together with some embossed Representations of pieces of the Skeletons of Eels, or some lesser Fish. All these were in Limestone; but advancing about three Miles further into *Brecknockshire*, at a place call'd *Lhan Elhi* we searched some Coal and Iron Mines. Their Coal-works were not Pits sunk like Draw-wells; but great Inroads made into the side of the Hill, so that three or four Horsemen might ride in abreast. The Top is supported with Pillars left at certain distances; and they make their By-lanes (as in other Pits) as the Vein requires. The Slat above this Coal afforded only Stalks of Plants, which we did not save,



\* Hist. Ox.  
c. 5. p. 55.

save, because it seem'd impossible to reduce them to their several proper *Species*. However, close by the Pit we found a Stone for substance like those they make Lime of; of a compress'd Cylinder Form; and as it were cut off even at each end: About eight Inches long, and three in breadth: Its *Superficies* adorn'd with equidistant Dimples, like Dr. \* Plot's *Lepidotes*, and in each Dimple a small Circle; and in the Center of each Circle a little Stud like a Pin's head. This is the only Curiosity of the kind I have seen; and is not referable to any thing I can think of either in the Animal or Vegetable Kingdom. Among the Iron Oars of the same Hills we found some new Spars, and several Specimens of Oars shot into a constant and regular Figure, tho' not reducible to any Animal or Vegetable Bodies.

About five Miles thence, at a place call'd *Pont y Pwl* in this County (where, as also at *Lhan Elhi*, there are Furnaces and Forges) we found more Coal and Iron Mines; and collected some fair Representations of the Leaves of Capillary Plants on the Iron Oar, but found no Branches. One Major *Hanbury* of this *Pont y Pool*, shew'd us an excellent Invention of his own, for driving hot Iron (by the help of a rolling Engine mov'd by Water) into as thin Plates as Tin: But without a Draught of the Machine I cannot give you a Notion of it. They cut their common Iron Bars into Pieces of about two Foot long; and heating them glowing hot, place them betwixt these Iron Rollers; not a-cross, but their Ends lying the same way as the Ends of the Rollers. The Rollers (mov'd with Water) drive out these Bars to such thin Plates, that their Breadth, which was about four Inches, becomes their Length, being extended to about four Foot; and what was before the Length of the Bars is now the Breadth of the Plates. With these Plates he makes Furnaces, Pots, Kettles, Sauce-Pans, &c. These he can afford at a very cheap rate, (about the third part of what is usual) and yet dares warrant them not less serviceable.

7. 335. p. 500. I copy'd out in *Glamorganshire* a large *Welsh* MS. wrote on Vellum about 300 Years since: It contain'd a Collection of the oldest Writers mention'd by Dr. *Davies*, at the end of the *Welsh* Dictionary: We have since found two or three Plants, which I had never met with before; viz. 1. *Lyfimachia Chamænerion dicta Alpina* C. B. Prodr. 2. *Bifolium minimum*. 3. *Solanifolia Circea Alpina* C. B. 4. Mr. Ray's *Alfine spuria pusilla repens foliis Saxifragæ aureæ*. We found indeed the first also last Year at *Hysvaë*, one of the Hills of *Snowdon*. Dr. *Richardson* brought it home with him last Year, and it flowering since in his Garden, he is fully satisfy'd it is distinct from the common *French Willow-Herb*.

In a steep Rock called *Craig y park*, and others in the Parish of *Ystrad Dyvodog*, we observed divers Veins of Coal, exposed to sight as naked as the Rock; and found a Flint Axe, somewhat like those used by the *Americans*. At *Goldoliff* in *Monmouthshire* we had some variety of form'd Stones: But what pleased me most was an *Asteria*, or Column Star-Stone, beset



beset with Sprigs the whole length of it, issuing from the Commisures of the Plates. This County abounds with *Entrochi*; one whereof I saw in a Rock at the Isle of *Barry*, about fifteen Inches in length; and another about ten Inches long, but as thick as a Cane. We took their Figures and Dimensions, but could not get off the Stones without breaking.

At *Kaer phily* Castle the People shewed us an Inscription (as they supposed) on one of the Steps of the Tower; a Copy whereof I here send you. I must confess I am not fully satisfied whether it were ever designed for reading, or for some kind of antique Ornament; but rather incline to the latter. The Stone was not design'd for a Step, there being none of the same kind in the whole Stair-case. The Marks were mostly worn out by treading; and it is possible they might be once more uniform; and some few Mistakes may have happened in the copying it as it is. I have sent the Stone to the *Muséum* at *Oxford*; where the Curious may be satisfied. Were it the old *Celtic* Character, which *Cæsar* says was like the *Greek*, 'twere a noble Discovery: But I fear our Ancestors (if ever they had any Writing) have left us none upon Stones.

At *Kapel Kirig* I found plenty of the *Bistorta*, and the *Nasturtium petraeum* of *Johnson*, and I think a new Plant in the small Lake of *Phynnon Urêch*, where the *Subularia* grew. I met with several rare Plants in other Places; as *Echium marinum* J. B. *Asparagus sylvestr.* *Eruca marina*; *Eruca sylvestris laciniata lutea*; *Dulcamara marina*; *Tithymalus marit.* *Beta marina*, &c. in *Caernarvonshire* and *Anglesey*: And in *Meirionnydshire* I found good store of our *Snowdon* Plants at *Kader Idris*, and *Balsamina lutea* in the High Road near a place call'd *Capel Begla*. In *South Wales* I found several Plants common, which I had never seen in *North Wales*; such as *Eruca sylvestris*, common on the Walls of their Towns and Castles; *Asplenium f. Ceterach Officin.* *Centaureum luteum perfoliatum*; *Linum sylvestre*; *Fagus*, &c. in *Pembrokeshire*. I met with two, which I suspect for new, viz. a *Tripolium*, and an *Anthyllis leguminosa supina, flore coccineo*.

Amongst several others, I found one large Crystal above *Phynnon Urêch* about seven Inches long, and as thick as my Wrist. In *Monmouthshire* I met with large petrified *Vertebrae*, and some few form'd Stones in each County: But I employed the greatest part of my time in copying Inscriptions, taking Catalogues of *Welsh MSS.* &c.

I spent three or four Days in the Coal-Pits of the Forest of *Dean*, where I found (I think) all your Capillaries, besides some other new Plants, three or four whereof are pretty curious; together with two Species of *Astrepodium* gather'd on the *Severn* Shore, the only Rarities of the kind. I suppose, that have been discover'd. I doubt not but (as you say) the Coal Plants have been observed by the Workmen long since, tho' they escaped the notice of Naturalists, who till this last Century contented themselves with bare reading and scribbling Paper. I find it well known to all our Country Colliers by the Name of *Carreg Redynog*,  
i. e.



i. e. the Ferny Stone; and one Mr. *Williams*, Archdeacon of *Cardigan*, who is a Person very curious and ingenious, told me he had observed much finer Patterns twenty five Years since in the Coal Pits of *Glamorganshire* than some that I shewed him. The Stalks of Fern and Hartstongue I think we often met with, but cannot say we saw any Roots. Indeed I know not well whether the Impressions of the Stalks might be easily distinguish'd from those of the Roots.

I have found several of the more ancient *British* Coins; whereof you see divers Figures in *Camden*. My Friend Mr. *Nicholson* quotes *Cæsar* for the *Britons* having no Coins; whereas on the contrary *Cæsar's* Words are, *Nummo utuntur parvo & æneo*: Nor can I see any reason to doubt of *British* Coins of all sorts of Metal, till he or some other inform whose Coins those are which Mr. *Camden* and other Writers take to be *British*. The Druid Beads are generally Glafs. I have met with two or three of them, that had a Snake manifestly painted round them: So that I take it for granted, the *Ova Anguina* of the *British* Druids were these Glafs Beads; tho' those of the *Gaulish* were the Shells of the *Echini orbiculati laticlavii*.

Sept. 1698.

We search'd this Summer the high Mountain by *Brecnock* call'd *Y Vann uwch deni*, but found nothing in it new, nor any great variety of rare Plants. The most choice were *Sedum Alpinum ericoides*, in abundance; *Argemone lutea*; *Rhodia Radix*; *Muscus cupressiformis*, and about half a dozen more of the common *Snowdon* Plants. *Lysimachia Chamænerion dicta* is a common Plant (by the Name of *Lbysie'r Milwr*, i. e. *Herba militaris*) in the Meadows through all the upper Parts of this County. We also met with *Sorbus legitima* and *Sorbus torminalis* (grown to as great a height as the *Ornus*) neither of which had ever occur'd before in *Wales*. But of all these Topical Plants I was surpris'd at none so much as the *Capillus Veneris verus* growing very plentifully out of a marly Incrustation, both at *Barry Island* and *Porth Kirig* in *Glamorganshire*, and out of no other Matter; and also that *Gnaphalium majus Americanum* should grow on the Banks of *Rymny River* (which runs altogether over *Iron Stone*) for the space of at least twelve Miles beginning near the Fountain-head in a Mountain of this County; and yet not a Plant of it to be seen elsewhere throughout *Wales*. In a great Lake called *Lbyn Savadhan* I found a pellucid Plant I had never met with before: The Leaves are extraordinary thin and transparent, in form not unlike small Dock Leaves; but the middle Rib is continued beyond the extremity, so that each Leaf has a soft Prickle at the end: By which Note I hope you will be able to tell me what it is. We found there also the *Hippuris saxea*; and two elegant sorts of small Leeches, which I suppose not describ'd.

The Limestone of this County affords small *Glossopetræ* and *Siliquastra*; but they are but very scarce in comparison of the quantity found in *Oxfordshire*, *Northamptonshire*, *Berks*, &c. The most considerable Rarities it affords are *Fayrie Causways*, which I call so in imitation of their *Giants Causway*



*Causways* in Ireland, *si licet magnis componere parva*: for whereas theirs may be half a Mile long; ours seldom exceed three Foot. Our Lime Quarries yield two or three Bodies congenerous with it, tho' of a very different Form.

2. In the High-Lands we found the People every where civil enough; *In Scotland,* and had doubtless sped better as to our Enquiries, had we had the *p. 97.* Language more perfect. We met with several Inscriptions, but none of them *Roman*; nor indeed ancient: However, we copied all we met of two hundred Years standing, &c. for the sake of the Orthography of the *Irish* Names, which are writ differently from what is now usual. We also took Figures of some Variety of their *Broaches*, or Silver and Brass *Fibulæ* used by the Women to clasp their *Koleriv*, a Garment answering our Nightrails. But what we were most diverted with, was their Variety of Amulets; many of which (if not all) were certainly used by the Druids, and so have been handed down from Parents to Children ever since. Some of these may be render'd in *English*, 1. *Snake-button*. 2. *Cock-knee Stone*. 3. *Toad-stone*. 4. *Snail-stone*. 5. *Mole-stone*. 6. *Shower-stone*; and 7. *Elf-arrow*.

The *Snake-button* is the same described in the Notes on *Denbighshire* in *Camden*, by the Name of Adder-Beads: But there are of these great Variety, as to Colour and Ornament; insomuch, that betwixt *Wales* and the High-Lands, I have seen at least fifty differences of them. In *Ireland*, tho' they are tenacious enough of all old Customs, I could hear nothing of them: So I conclude, that either the *Irish* had no *Druids*, or that their want of Snakes frustrated their advancing that Imposture amongst the People: But there were but a few Places where we inquired; and perhaps we may hereafter hear of them in other Parts of that Kingdom. Not only the Vulgar, but even Gentlemen of good Education throughout all *Scotland*, are fully perswaded the Snakes make them, tho' they are as plain Glass as any in a Bottle.

The *Cock-knee Stone* is an *Echinites pileatus minor*, of Flint; which they firmly believe to be sometimes found in the Knees of an old Cock; and a Fellow in *Mul* protested to me (tho' I was never the nearer believing him) that he had with his own Hands taken one of them out of a Cock's Knee; and named two or three others, who had done the like.

The *Toadstone* is some Peble, remarkable for its Shape and sometimes variety of Colours. This is presumed to prevent the burning of a House, and the sinking of a Boat: And if a Commander in the Field has one of them about him, he will either be sure to win the Day, or all his Men shall fairly die on the spot.

The *Snail-stone* is a small hollow Cylinder of blue Glass, composed of four or five Annulets: So that as to Form and Size it resembles a midling *Entrochus*. This, amongst others of its mysterious Virtues, cures Sore Eyes.



The *Mole-stones* are Rings of blue Glass, annulated as the aforefaid Snail Stones.

They have the *Ombriæ pellucidæ* (which are Cryſtal Balls, or Hemispheres, or depressed Ovals) in great eſteem for curing of Cattle; and ſome on *May Day* put them into a Tub of Water, and beſprinkle all their Cattle with that Water, to prevent being Elf-ſtruck, bewitch'd, &c. And

As to this *Elf-ſtricking*, their opinion is, that the Fairies (having not much Power themſelves to hurt Animal Bodies) do ſometimes carry away Men in the Air, and furniſhing them with Bows and Arrows, employ them to ſhoot Men, Cattle, &c. I doubt not but you have often ſeen of thoſe Arrow-heads they aſcribe to Elfs or Fairies: They are juſt the ſame chip'd Flints the Natives of *New England* head their Arrows with at this Day; and there are alſo ſeveral Stone Hatchets found in this Kingdom, not unlike thoſe of the *Americans*. I never heard of theſe Arrow-heads nor Hatchets in *Wales*; and therefore would gladly be informed whether you have ever heard of their being found in *England*. Theſe Elf Arrow-heads have not been uſed as Amulets above thirty or forty Years; but the uſe of the reſt is immemorial: Whence I gather they were not invented for Charms, but were once uſed in ſhooting here, as they are ſtill in *America*. The moſt curious, as well as the Vulgar throughout this Country, are ſatisfied they often drop out of the Air, being ſhot by Fairies, and relate many Inſtances of it; but for my part I muſt crave leave to ſuſpend my Faith, until I ſee one of them deſcend.

Near *Glaſcow* we found two Foffils *toto genere* new: One reſembling ſmall Joints of a Lobſter's Arm, but much longer; the other ſomewhat like large *Gloſſopetræ*, or perhaps like the *Mucro* of a *Pinna marina*. Theſe figur'd Stones are found there in an Iron-ſtone, tho' I never ſaw them in that kind of Matter in *Wales*. We found both Shells and *Entrochi* gone off to that Subſtance, having changed their Matter and much of their Shape. Near the ſame Town ſearching for theſe Foffils, I found in the miſt of the Lime-ſtone ſome *Cochlitæ* compos'd of Flint; but *Conchitæ* of Spar, gone off ſo far from the Shape of Shells, as hardly to be known, were it not from others in the ſame place retaining their Shape more entirely. The Principal of the College ſhew'd us Stones, he had lately procured for the Library, having *Roman* Inſcriptions. Theſe we copied, and ſeveral others elſewhere of the ſame Date. They keep theſe Stones at *Glaſcow* very carefully in the Library; and the Principal was daily expecting two or three more that had been promiſed him.

Mr. *Southerland* gave me Specimens of the *Chamaepericlimenum*, *Adiantum acroſticon*, and *Pyrola Alſines flore Europæa*. I had nothing for him in exchange, but Samples of the *Vitis Idæa foliis Myrtinis criſpis Meretti*, together with ſome of the Berries. This I found plentifully for ſome Miles together in that — and of *Mul*, next to *Ey Columb Kil*.

'Tis



'Tis very different from the common *Vitis Idæa sempervirens fructu rubro*; being of a larger Plant, much more branched; the Leaves of a crisp'd Surface, and the Berries (which as they told me it retains all the Year) liker unto those of Holly. Going up one of the high Hills of *Mul* we found *Rhodia Radix*; *Pes Cati*; *Cotyledon hirsut.* *Vaccinia rubra*; *Sedum Alp. trifido folio*; and (which I had never seen grow spontaneously) *Alchimilla Alpina quinquefolia*. We found in this Island a curious *Fucus arboreus* with a ruffled Stalk, whereof we took a Figure.

3. We continued not above three Days at *Dublin*, when we steer'd our Course towards the *Giants Causeway*. The most remarkable Curiosity we saw by the way, was a stately Mount at a place call'd *New Grange* near *Drogheda*; having a number of huge Stones pitch'd on end round about it, and a single one on the top. The Gentleman of the Village (one Mr. *Charles Campbell*) observing that under the green Turf this Mount was wholly compos'd of Stones, and having occasion for some, employ'd his Servants to carry off a considerable Parcel of them; till they came at last to a very broad flat Stone, rudely carved, and placed edgewise at the bottom of the Mount. This they discover'd to be the Door of the Cave, which had a long Entry leading into it. At the first entering we were forc'd to creep; but still as we went on, the Pillars on each side of us were higher and higher; and coming into the Cave, we found it about twenty Foot high. In this Cave, on each hand of us was a Cell or Apartment, and another went on straight forward opposite to the Entry. In those on each hand was a very broad shallow Bason of Stone, situated at the Edge. The Bason in the right hand Apartment stood in another; that on the left hand was single; and in the Apartment straight forward there was none at all. We observed that Water dropt into the right hand Bason, tho' it had rained but little in many days; and suspected that the lower Bason was intended to preserve the superfluous Liquor of the upper, (whether this Water were sacred, or whether it was for Blood in Sacrifice) that none might come to the Ground. The great Pillars round this Cave, supporting the Mount, were not at all hewn or wrought; but were such rude Stones as those of *Abury* in *Wiltshire*, and rather more rude than those of *Stonehenge*: But those about the Basons, and some elsewhere, had such barbarous Sculpture (*viz.* Spiral like a Snake; but without distinction of Head and Tail) as the fore-mentioned Stone at the Entry of the Cave. There was no Flagging nor Floor to this Entry nor Cave; but any sort of loose Stones every where under Feet. They found several Bones in the Cave, and part of a Stags (or else Elks) Head, and some other things, which I omit, because the Labourers differ'd in their Account of them. A Gold Coin of the Emperor *Valentinian*, being found near the top of this Mount, might bespeak it *Roman*; but that the rude carving at the Entry and in the Cave seems to denote it a barbarous Monument. So, the Coin proving it ancients than any Invasion of

*In Ireland,*  
*by the same.*  
*ib. p. 503.*



the *Ostmans* or *Danes*; and the Carving and rude Sculpture, Barbarous; it should follow, that it was some Place of Sacrifice or Burial of the Ancient *Irish*.

\* v. Ph. Tr. We have the same Stone, \* as in the *Giants Causeway*, on the Top of  
n. 212. & 241. *Cader Iris*, one of the highest mountains of North *Wales*; but ours is less  
Abr. Vol. II. elegant, and does not at all break off in Joynts; nor could I satisfy my self  
p. 511. & seq. that there are set Joynts (as in the *Entrochus* and *Asteria*) in the *Basaltes*  
of *Ireland*; but that it is the Nature of the Stone to break off in such a  
convex Form. However, we could perceive no Seams in these Pillars,  
excepting on those Sides that were exposed to the Weather.

Another remarkable Curiosity we met with, was a Copper Trumpet  
like a Sow-Gelders Horn; having the hole for sounding near the midst,  
and two Rings at the smaller End; above two foot long. Three of  
these were found in an old *Karn* (i. e. a great heap of Stones) at *Balle*  
*Niwr* near *Carreg Fergus*.

\* v. sup. We could make nothing of the Petrifying Quality of \* *Loch Neach*;  
Part III. but that they sometimes find Stones there, having the Grain of Wood.  
p. 229. We met with some *Irish* Inscriptions there, and others here; which none  
of the Critics in that Language we conversed with could interpret.

Near *Larne* in *Antrim* we met with one *Eoin Agniw*, whose Ancestors  
had been Hereditary Poets, for many Generations, to the Family of the  
*O Neals*; but the Lands they held thereby being taken away from his Fa-  
ther, he had forsaken the Muses and betaken himself to the Plow: So we  
made an easy Purchase of about a dozen ancient Manuscripts on Parch-  
ment.

n. 336. p. 524. I have in divers Parts of the Kingdom pick'd up about 20 or 30 *Irish*  
Manuscripts on Parchment: But the Ignorance of their Criticks is such,  
that tho' I consulted the chiefest of them, as *O Flaberty* (Author of the  
*Ogygia*) and several others, they could scarce interpret one Page of all  
my Manuscripts; and this is occasioned by the want of a Dictionary,  
• which it seems none of their Nation ever took the trouble to compose.  
I was informed (but how truly I know not) they have lately printed one  
at the *Irish* College in *Lovain*; which if I could procure, I should not  
despair of being in a short time able myself to understand these Manu-  
scripts; tho' many of them being but insignificant Romances, it would  
scarce quit the Pains. What I most value amongst them are their old  
Laws, which might give some Light to the Curious as to many of their  
National Customs; and some of their old Poems: But all are of use to  
any that would compose a Dictionary of their Language; which was  
anciently (considering the narrowness of their Knowledge as to Arts and  
Sciences) doubtless very copious.

I saw no Coins found there, but the *Roman* Gold Coin of *Valentinian*  
*jun.* formerly mentioned; several of our old *English* since the Conquest;  
and one cast Brass Piece inscribed with *Runic* Letters, which I take to  
have been a *Danish* Amulet. Several of our old *British* Monuments,  
called



called *Kaer*, *Karn*, *Cromlech*, &c. we met with; and found that they distinguished them by the same Names. What were peculiar to themselves, were their high round Towers for Belfreys; their round Entrenchments, commonly called *Danes Rathes*; and the Elf-Arrow Heads of Flint.

About *Slego* and *Bali Shany* we had good Success as to Figur'd Stones; where we met with Variety of *Astropodia* and *Astrorrhizæ*, or *Modioli*, not yet figured nor described, together with other Curiosities in that kind; all which (together with the Manuscripts) I have long since sent to *Oxford*.

In the same Neighbourhood, on the Mountains of *Ben Bulben* and *Ben Buishgen*, we met with a Number of the rare Mountain Plants of *England* and *Wales*, and three or four not yet discover'd in *Britain*. Mr. *Heaton's Chamædrys Alpina* is a common Plant on those Hills, as also on divers other Mountains and Heathy Grounds in *Connacht* and *Munster*. In the Isle of *Aran* (near *Galloway*) we found great plenty of the *Adiantum verum*, and a sort of matted Campion with a white Flower, which I bewail the Loss of; for an imperfect Sprig of it was only brought me; and I waited afterwards in Rain almost a whole Week for fair Weather, to have gone in quest of it. In most of the mountains of *Galloway* and *Mayo* grows an elegant sort of Heath, bearing large Thyme-leaves, a Spike of fair purple Flowers like some *Campanula*, and viscous Stalks. I know not whether it be any thing related to the *Cisti Ladaniferæ*.

In the same Places *Pinguicula flore carneo minore* is a common Plant, and a sort of *Ros Solis*, which I take to be undescribed. *Sedum ferratum foliis pediculis oblongis insidentibus* is exceeding common on all the Mountainous Tracts of *Mayo*, *Galloway*, and *Keri*. On the Mountains of *Keri*, *Sanicula guttata* grows in abundance; together with some other rare Plants, as the *Arbutus*. *Cotyledon hirsuta*. *Cirsium humile montanum Cynoglossi folio polyanthemum R. Syn. Alchimilla Alpina pentaphyllos*. *Sanicula aizoides inter guttatam & Sedum ferratum ambigens*. *Veronica procumbens maxima, an N. D? &c.* But the Tories frustrated our Curiosity here, tho' no where else in the Kingdom. *Pentaphylloides fruticosa* we found plentifully amongst the Lime-Stone Rocks on the Banks of *Loch Crib* in the County of *Galloway*; and Dr. *Merret's Vaccinia rubra foliis Myrtinis crispis* (a very beautiful Plant) we found to be no rarity in this Kingdom.

We met with some Marine Animals of the Exanguious kind, that were Strangers to us.

III. On *Tuesday August* the 13th N. S. at half an Hour past Ten in the Evening, I, in company of four more English and one Dutch-Man, with Horses and Servants to carry our Provision, together with a Guide (which is the same that has conducted all those that have been this Journey for many years) set forward from the Port of *Oratava*. The Night being somewhat cloudy, and the Moon in the full at 12 the Night following.

*A Journey to the Pike of Teneriffe by Mr. Edens, n. 345. p. 317.*



At half an Hour past Eleven we came to the Town of *Oratava*, which is about two Miles from the Port, where we stopt for about half an Hour, to get walking Staves to assist us in our ascending the Steep of the Pike. At One a-Clock on *Wednesday* Morning we came to the Foot of a very steep Rising, about a Mile and half above the Town of *Oratava*, where it began to clear up; and we saw the Pike with a white Cloud covering the Top of it like a Cap. At Two a-Clock we came to a plain place in the Road, which the Spaniards call *Dornajito en el Monte Verde* (the little Trough in the green Mountain) so call'd I suppose because a little below this Plain, on the Right hand as we went, there is a deep Hollow; at the upper End of which Hollow, there is a Spout of Wood placed in a Rock, through which there runs very clear and cool Water, which comes from the Mountains; and at a Descent a little lower than the Spout there is a Trough into which the Water comes. At Three, after travelling a Road, which was sometimes pretty smooth and at other times very rough, we came to a little wooden Cross, by the Road side on the Left-hand, which the Spaniards call *la Cruz de la Solera* (The Cross of the *Solera*). A *Solera* is a long Pole with a Hole at each end, which the Spaniards use to draw Wood with, by fastning one end to the Wood and the other to the Oxen. This Cross was made with a Piece of a *Solera*, and for that reason is so call'd, but why it was set up in this place I can't tell, unless it was because somebody was kill'd thereabouts. At this place we also saw the Pike before us; and altho' we had come up hill quite from the Port, yet to our thoughts it seem'd almost as high here, as when we were there, the white Cloud still hiding the greatest part of the Sugar-loaf.

After riding about half a Mile further, we came to the side of a Hill which was very rough and steep, (the place call'd *Caravala*) where are a great many Pine Trees that grow on both sides the Road for a great way, both on the Right-hand and the Left, one of which that was close to the Road, on the Right-hand as we went, our Guide desir'd us to observe; it having a great Branch growing out, which with the Boughs that were upon it look'd like the Forepart of a Ship. And from the likeness this Tree has to a Ship I suppose the Place took its Name, for *Caravela* signifies an old-fashioned Vessel formerly much used in *Spain*, sharp before, ill shap'd every way, and all the Masts stooping forwards; their Sails were all Mizen Sails, that is, Triangular; they all lie nearer the Wind than other Sails, but are not so commodious to handle. Amongst these Trees, not a great height in the Air, we saw the Sulphur discharge its self like a Squib or Serpent made of Gun-powder, the Fire running downwards in a Stream, and the Smoak ascending upwards from the place where it first took Fire; and like this we saw another, whilst we lay under the Rocks the next Night at *la Stancha*, part of the way up the Pike; But I could not observe whether either of them gave any Report as they discharg'd. At three quarters after Four we came to the Top of this high rough and steep Mountain.



tain, where grows a Tree which the Spaniards call *el Pino de la Merenda*, The Pine-Tree of the Afternoon's Meal. This is a large Tree, and is burnt at the Bottom, as having had Fires made against it; and in the burnt place there issues out Turpentine, a little of which I brought with me. At a few Yards distance from the Tree we had a Fire made, where we stay'd and baited our Horses, and breakfasted our selves. These Hills are very sandy, and there are a great many Rabbits which breed there; There is also much Sand found a great way up the Pike it self, and not a great way below the Foot of the Sugar-loaf, some of which I brought down with me. At three quarters after Five we set forwards again, and at half an Hour past Six came to the *Portillo*, which in Spanish signifies a Breach or Gap. We saw the Pike about two Leagues and a half before us, cover'd still with a Cloud at Top; and the Spaniards told us we were about two Leagues and a half from the Port.

At half an Hour past Seven we came to *las Faldas*, that is the Skirts of the Pike; from whence all the way to *la Stancha*, which is about a Quarter of a Mile up from the Foot of the Pike, we rode upon little light Stones, for the most part not much bigger than ones Fift; and a great many not much broader than a Shilling: and if we kept the beaten Track which was used before, it was not so deep, but if we turn'd out of it the Horses went almost over their Feet. I lighted and made a Hole there, thinking to find how deep these little Stones lie, but could not find the Bottom; which makes me conclude they may cover the Ground for a great thickness. There are many great vast Rocks, some of them two Mile or thereabout from the Foot of the Pike, which the *Pike-man* told us was cast out from the Top of the Pike at the time it was a *Vulcano*; many of them lie in Heaps of above threescore Yards long, and I observ'd that the further these Rocks lie from the Foot of the Pike, the more like they are to the Stone of other common Rocks: But the nearer we went to the Pike we found them more black and solid; and some of them, tho' not many, were glossy like Flint, and all extream heavy. Those that shone so, I suppose, retain'd their natural Colour, but there are some that look like Dross that comes out of a Smith's Forge, which without doubt was occasioned by the extream Heat of the place they came from. Some of these great Rocks were thrown out of the *Caldera* or Kettle in the Top of the Pike; and others from a Cave or Cistern which is a pretty way up the side of the Pike, and has by some been thought to have no Bottom, more of which I shall say anon.

At Nine on *Wednesday* Morning we arrived at *la Stancha*, about a quarter of a Mile above the Foot of the Pike on the East-side, where are three or four large hard and solid black Rocks lodg'd: under some of these we put our Horses, and under others we lay down our selves to sleep, after having refresh'd our selves with a little Wine: and we had a Fire made in order to get our Dinner ready, where a Cook we took along with us both roasted and boiled our Meat and Fowls very well. We slept here for about two Hours, then rose again, and at about Two in the Afternoon went to dinner. There are several Mountains that lie Eastward from



from the Pike at four or five Miles Distance, call'd the *Malpeses*, and one more lying a little more to the Southward call'd *la montana de rejada*; all which were formerly *Vulcano's*, tho' not so great as that of the Pike, as appears by the Rocks and small burnt Stones that lie near them, just in the same manner as about the Pike. Still being at *la Stancha*, after we had dined we lay down again to take a Nap, under the Rocks as before Dinner, but not sleeping very well we all got up again, the rest of them spending the Afternoon at Cards, &c. But I made it my business to admire the strangeness and vastness of that great Body, which indeed is very wonderful, in so much that its impossible to express, to one that has never seen it, in what a manner that confused Heap of Rubbish lies; for it may very well be stiled one of the greatest Wonders in the World. About Six at Night we saw *Grand Canaria* from *la Stancha* bearing from us *E. by N.*

At nine at Night, after having had our Suppers, we retired to our former Lodgings, where laying Stones for our Pillows and our Cloaks for Bed-cloaths, we endeavoured to get to sleep, but all in vain for a great while. Some lying pretty nigh a Fire complain'd of being burnt on the one side and froze on the other (for the Air was very cutting and sharp) others happening to lie in the place where there was a great many Fleas; tho' it be something strange that Fleas should be found there, the place being so cold in the Night: perhaps the Goats sometimes get under these Rocks and so leave them; and I am inclin'd to believe it, because the Guide and I found a dead Goat in a Cave at the very top of the Pike. I suppose this Goat straggling up here by chance was benighted, and so finding the Cold got into this place for heat, where meeting with too much of it, and a very strong sulphureous vapour, it overcame him; for he was almost dried to Powder. But to proceed, betwixt Eleven and Twelve we got to sleep, and slept till One, when waking, our Guide told us 'twas time to prepare for our Journey. We immediately rose, and by half an hour past One we were all upon the march, and leaving our Horses and some of our Men behind, we went away fasting, excepting about two Mouthfulls of Wine apiece, which we took at our up-rising. Betwixt *la Stancha* and the top of the Pike there are two very high Mountains and the Sugar-Loaf, each of which Mountains is almost half a Mile's walking: on the first of them the Rubbish is more small, and we were apt to slip back as we stept upwards. But the uppermost is all composed of hard loose rocky great Stones, cast one among another in a very confused Order. After resting several times we came to the top of the first Mountain, where we drank every one of us a little more Wine, and eat each of us a bit of Ginger-Bread we had amongst us. Then being pretty well refresh'd, we set forwards again to ascend the second Mountain, which is higher than the first, but is better to walk on because of the firmness of the Rocks. After we had travell'd for about half an hour up the second Mountain, we came within sight of the Sugar-loaf, which before we could not see by reason of the Interposition of these great Hills. After



we were arriv'd to the top of this second Mountain we came to a way that was almost level, but bearing some small matter up-hill; and about a Furlong farther is the Foot of the Sugar-loaf, which we soon after came to. Then looking upon our Watches found it to be just three a-Clock. The Night was clear where we were, and the Moon shone very bright, but below over the Sea we could see the Clouds, which look'd like a Valley at a prodigious Depth below us. We had a brisk Air, the Wind *S. E.* by *S.* as it was for the most part whilst we were upon our Journey. Whilst we sat at the Foot of the Sugar-loaf, resting and refreshing our selves as before in other places, we saw the Smoak break out in several places, which at first look'd like little Clouds, but they soon vanish'd, others not long after coming in their room from the same or other places.

We set forwards to ascend the last and steepest part of our Journey, *viz.* the Sugar-loaf, exactly at half an hour past Three, and after we had rested twice or thrice, I left the Guide and the rest of my Company, and ran forwards; and when I was got very nigh the top (which was at three quarters after Three) two more of the Company deserted, and came up about five Minutes after me; the rest of the Company and the Guide coming up to the top just at Four.

The Shape of the top of the Pike is partly oval, the longest Diameter lying *N. N. W.* and *S S E.* and is, as nigh as I could guess, about 140 Yards long; the Breadth the other way being about 110. Within the top of the Pike is a very deep Hole call'd the *Caldera* (or *Kettle*) the deepest part of which lies at the *South* end: It is I believe forty Yards deep, reckoning from the highest side of the Pike: but it is abundance shallower reckoning from the side opposite to *Garachica*. The sides of this Kettle are very steep, in some places as steep as the Descent on the outside of the Sugar-loaf. At the bottom of this Kettle we all were, where lie a great many very large Stones, some of them higher than our Heads. The Earth that is within side the Kettle, being roll'd up long and put to a Candle, will burn like Brimstone. Several places within side the top of the Pike are burning, as on the Out-side; and in some places if you turn up the Stones you'll find very fine Brimstone or Sulphur sticking to them. At these Holes where the smoak comes out there also comes forth a great heat, so hot that one cannot endure one's Hand there long. At the *N. by E.* side within the top is the Cave where we found the dead Goat; in which Cave sometimes the true Spirit of Sulphur distills, as they say, but it did not drop whilst I was there. The Report is false about the Difficulty of breathing upon the top of this place; for we breath'd as well as if we had been below; we eat our Breakfast there, and I was up in all for about two hours and a quarter.

Without doubt the Quicksilver would have fell very much upon this high place, if I had had but the good Fortune to have got a couple of Barometers to try. But there is no such thing in this Island, and I was fearful of not getting Company in the mind to go up with me another

Year.



Year (for to go up by ones self is very chargeable) else I would have sent to *England* to have been supply'd, tho' the Expence had come all out of my Pocket. Before the Sun rose I think the Air was as cold as I have known it in *England*, in the sharpest Frost I was ever in; I could scarcely endure my Gloves off. There was a great Dew all the while we were there till Sun rising, which we could find by the wetness of our Clothes; but the Sky look'd thereabouts as clear as possible. A little after Sun rising we saw the Shadow of the Pike upon the Sea, reaching over the Island of *Gomera*; and the Shadow of the upper part, viz. of the *Sugar-loaf*, we saw imprinted like another Pike in the Sky it self, which look'd very surprizing: but the Air being cloudy below us, we saw none of the other Islands but *Grand Canaria* and *Gomera*.

At six on *Thursday* Morning we came from the top of the *Sugar-loaf*; at seven came to the Cistern of Water which is reported to be without bottom: this the Guide says is false; for about seven or eight Years ago, when there was a great *Vulcano* in this Country, the Cave was dry and he walk'd all about it, and said that the deepest part of Water, when we were there, was not above two Fathoms.

The Dimensions of this Cave I guess to be as follows.

Length about 35 Yards

Breadth ——— 12

Ordinary Depth 14 from Top to Bottom.

Upon the furthest side grows white Stuff, which the *Pikeman* told us was Salt-Peter. There was both Ice and Snow in it when we were there; and the Ice was of a great Thickness covered with Water about Knee deep. We let down a Bottle at the end of a String for some of the Water, in which we put some Sugar and drank it, but it was the coldest I ever drank in my Life. The Ice was broken just under the Mouth of it, where we could see the Stones lie at the Bottom, for it was very clear. A little to the right hand within this Cave the Ice was risen up in a high heap, in form of a Spire Steeple or like a *Sugar-loaf*; and in this place I believe the Water comes in. I should have been glad to have come at it, to let down a Line to try whether there may not be some Hole that the Guide knows not of, that may be of great Depth. In our way home, we came by a Cave three or four Miles from the Pike, where are a great many Skeletons and Bones of Men; and some say there are the Bones of Giants in this Cave, but we know not how many Bodies are laid here, nor how far the Cave may go.

We came home to the Port at about six a-Clock this Evening, being *Thursday, August 15, 1715. N. S.*



riosity of a young Lady born Deaf and Dumb, yet taught by Dr. *Amman* to speak very intelligibly, I heard her read *Dutch* and *Latin*; she is about seventeen Years old, the only Child of a Wealthy Merchant.

Here I was desirous to see the first Book printed by *Costerus*, which *Van Dalen* himself had never seen, and with much trouble obtain'd to do it; I find it not to be *Donatus*, as the *Inscriptiones Hollandicæ* say, nor *Virgil* or *Tully's Offices*, as others have acquainted the World; but a *Dutch* piece of *Theology*, printed on one side only of the Paper; and after this is a single page of *Latin* entitul'd, *Liber Vitæ Alexandri Magni*, which made some believe it to be *Q. Curtius*, but it is a monkish *Latin* of that time. This and the *Theology* were printed in the Year 1430, whereas the *Inscriptions* and some other Authors have told us from *Costerus's* Picture, that Printing was by him invented but *Anno* 1440. But a Picture of *Costerus* before another *Dutch* piece (bound up in the same Volume and Printed 1432) bears the date of 1430, under which Picture is the *Inscription* mention'd by Mr. *Ray*, (only the date ten Years sooner) and the *Tetrastic*, which is transcrib'd by the Author of the *Inscriptions* from an *Effigies* of *Costerus*, which was then extant in a Garden of this place, but is not now to be found.

I was surpriz'd at *Amsterdam* to see a most curious *Physick Garden*, admirably instructed, and in excellent order; which because it has more space and foreign Plants, far exceeds *Leyden*. Here are also *Series Lætionum*. Our Travellers have not made much mention, as I know of, of these things, nor any at all of *Boln*, where is a Chamber well furnish'd with Rarities, considering there is no University, Schools nor Gardens, nor any Professors. There are no Catalogues Printed in *French* or *Latin*, but when I have furnisht my Memory with the help of a little *Dutch*, if you have not receiv'd any Account, I shall transcribe them by themselves, being too long for a Letter. Besides these, there occur'd here a Rarity not then publickly expos'd, two Female Children joyn'd together from the Neck to the Navel; their Picture was with Arms embracing, and Legs twist'd, all Parts and Joints entire to both, the *Viscera* too all double and perfect, the Head only single, but appertaining to both, and looking over the right Shoulder of one, and the left of the other. They had been open'd before I saw them; I could not learn by the Mother or Father, whether the *Aspera Arteria* and *Gula* did not divide as they enter'd into the Stomach and Lungs, or whether they were continu'd separate, nor any account of the Brain; they were born alive before seven Months: The Father, *John Ameston*, a *French* Soldier, but deserted to this place. He preserves them with the Skin and Muscles, by sponging them with spirit of Wine. He asks 300 Guilders for 'em, too much for a Traveller to expend upon one thing.

At *Maestricht* I went into the Quarry, of which you have an Account \**n.67.p.2051.* in your \**Transactions*, but it is more wonderful than there describ'd, and Abr. Vol. 11. p. more large, being three Hours in length, and one in breadth, and capable 463. to shelter 100000 Men. It cost me a fit of an Ague, thro' its excessive



Chilness. The Stone dug from hence is much like our *Kettering*; The Jesuits have here a very fine Chapel built of it.

*Franciscus Linus's* Dyals at *Liege*, the Original of those formerly in our *Privy Garden*, are shamefully gone to decay, none remaining of use, but that which distinguishes the Hours by feeling, and the Globe which shews it in all other parts of the World. Here is but one in the Society that understands any thing of this matter, and he is endeavouring to make a Weather Dyal, that shall have a Flux and Reflux like the Sea, but it is yet brought to no Perfection.

At *Namur* are no Curiosities, but Military, except only the *Cachot* cut in the Rock of the Castle, with Apartments for 600 Men, and all Rooms of use, as Kitchens, &c. this was done by the Order of *Mareschal Boufflers* to defend the Garrison from the Bombs, and was the labour of four Years. I forgot that at *Liege* is Sir *John Mandevil's* Tomb, whose Epitaph is also at *St. Albans* with us, which may be hard to be reconcil'd.

Since my coming to *Bruxelles*, I have seen a young *Friesland* Boy about five Years old, round the Pupil of whose Eye they pretend is naturally engraven *Deus Meus*, and the same in *Hebrew*. This is lookt upon as a prodigious Miracle in these Parts; but upon nice surveying it, I could perceive it was only the *Iris* of the Eye, not circularly joyn'd, but lash'd out into *Fimbriae*, which here and there might be thought to form some imaginary Letters; as beginning at the *Lacrymal* Corner of the left Eye, there is something like D and I and V, but not a Footstep for the strongest Fancy to work out any more, nor any Letter of *Hebrew* in the right Eye, as they pretended. I don't doubt, but as the Boy grows up, the others may conjoyn again: But it was like to have been of danger to me to have discovered this Matter in these superstitious Countries; for acquainting a Gentleman in *English* of this Cheat, one of the Mob happen'd to understand it, and I was forc'd to make the best of my way.

In another Letter from the *Hague*, dated *June 16, 1699*. The same Person writes that at this Place there are very few natural Curiosities; but a piece of Art, that of its sort I believe never was parallel'd, which is perform'd by one *Elizabeth Pyberg*, who cuts in Paper not only Towns, as *Loo* and *Hounslerdyke*, but Faces to an extream Likeness; She has done *King William* and *Queen Mary* better than any Limner I ever saw, and refuses 1000 Guilders for the Pieces; it is so curious that I could not believe the Queen's Drapery not to be Point, till I had most exquisitely enquir'd into it.

V. It is call'd the *Sunk Island*, I suppose, from the sinky marshy Ground about it. One may make pretty sure Guesses of its Original, because 'tis yet within the Memory of Man, since it began to raise its Head above the Ocean, there being several old People here alive, who can remember when there appear'd nothing of it but a wast and barren Sand; and that only at Low-Water too, when for the space of a few Hours it shewed its Head, and then was buried again till the next Tide's Retreat: thus successively it liv'd and died until the Year 1666, when it began to

Of the Sunk  
Island in  
Humber, com-  
municated by  
John Cham-  
berlayn, Esq;  
n.361.p.1014.

main-



maintain its ground against the Insults of the Waves; about which time it began to be rescued wholly from future Danger, by the Care and Industry of Colonel *Gilby*, who having, as I am inform'd, a Lease or Gift of it from the Crown, did raise Banks about the rising Grounds of it, and so defending it from the Encroachments of the Water, it became firm and solid; and in a short time afforded good Pasturage for Sheep and other Cattel. The Expences at first to improve it to what it is, must needs have been very considerable; it being encompass'd with high Banks, and deep Canals for receiving and discharging the Liquid Element, which every now and then notwithstanding threatens to re-possess it self of its ancient Hereditament, but hitherto in vain; for I now acquaint you of its present Safety.

The Island is now about nine Miles in Circumference within the Banks, which seem to render it impregnable against all future Attacks of the Sea, and is of a very fat and fertile Soil, affords good Grass, Corn and Hay, and is replenished with numerous flocks of Sheep, which are of a larger Size and finer Wool than those in *Holderness*, from which it is divided by about two Miles in Water; and from *Lincolnshire* by about four. It is stor'd with vast Numbers of Rabits, that seem innumerable, they appearing through all Parts in prodigious Swarms; their Skins are counted the finest in *England*, of a dark Mouse Colour, Shagg'd, and soft as Silk. There are also Cows and Horses feeding constantly in the Place, with great plenty of Wild Fowl.

The Inhabitants are not so numerous, there being only three Families that live constantly upon the Place; however they are never too solitary, there being abundance of Workmen and Labourers that continually resort thither; sometimes I am told to the number of an Hundred and upwards, for the repairing of the Banks, &c. The yearly Income of the Proprietor Mr. *Gilby*, amounts to about 800*l.* and pays the King's Taxes to those who Collect for the *East-Riding*, and is usually up-lifted by those of the Liberty and Township of *Ottringham*, from the Marshes of which there is a Passage over the Sands to the *Sunk* at Low-water. But this Custom of paying the King's Cess to them, proceeds only from the Conveniency, not Necessity; for it never belong'd to that or any other Parish, so that I cannot resolve you in what Diocese this Island lies, unless it had been united to some neighbouring Parish, or converted to one of it self; which if effected, the Tythe of Lambs, Wool and Rabits, &c. would make up a handsome Benefice. It lies nearer indeed to the Diocese of *York*, by at least two Miles, than to that of *Lincoln*, being two Miles South of *Holderness*, in the River *Humber*, and four Miles North of *Lincolnshire*, &c.

V. In Portu Liburno Octobris Calendis Anni 1703 appuli. Urbs in planitie sita ad maris littora, montibus utrinque elatis, ut ut non admodum ampla, Emporium tamen elegans & probe munitum. Aer non admodum salubris, & Tertiana duplex, quæ hîc difficilioris curationis, frequens mihi narrabatur. Itaque quia Palladem hic Mercurio cedere intellexeram, post octi-

*Observables in Italy by Dr. Breynius, n. 334. p. 447.*



oetidianam quietem, Pisam aliquot milliaribus Liburno distantem, cum quodam ex conterraneis meis Itineris Socio profectus sum. Iter erat amoenissimum, per planam fertilemque terram, interpositis sæpius Nemo-ribus Quercu, Ilice, & Subere, ut & Myrto frequentibus.

Pisa quondam Resp. & elegans Civitas, nunc M. Hetruriæ Duci sub-jecta ordine secundo, multum de pristino splendore ac hominum copia, quod vulgo notum est, amisit. Universitas fuit quondam hîc celebrior, quàm quidem hoc tempore. Quatuor habet Collegia Oxoniensibus nequaquam æquiparanda : quorum primum dicitur Collegium Sapientiæ; secundum est Collegium Ferdinandi, à Ferdinando I. M.H.D. Anno 1595. extructum in loco, ubi erant Ædes Bartholi famosissimi J. C. ut docet In-scriptio; tertium Puteanum, à Puteo Episcopo Nomen gerens, Anno 1605. erectum. Sed præsentibus feriis omnes Scholæ clausæ erant, ipsis Novem-bris Calendis recludendæ. Hortus Botanicus Pisanus Rei Herbariæ Pro-fessoribus satis notus à Cosmo I. M. Hetr. Duce Anno 1547. septennio sc. post Patavinum, qui primus fuit, institutus est, eique præfectus Lucas Ghinus (teste Castello in Opt. Med.) cui successit Botanicorum sui ævi Princeps Andreas Cæsalpinus. Citatus Lucas Ghinus, à Jo. Antonio Bu-maldo (quo ficto Nomine Ovidius Montalbanus anagrammaticè latet) in sua Bibliotheca Botanica primus Hortorum publicorum Academicorum Fundator dicitur. Ædes autem Horto adjacentes, in quibus plurima ra-riora Naturalia & Artificialia servantur, Ferdinandum I. Fundatorem ag-noscunt Anno 1595. ut Inscriptio in portæ limine testatur. Antequam ad Hortum itur in atrio multa Balænx ossa reposita videntur; in parte su-periore verò Gazophylacium rerum Naturalium & Artificialium bono or-dine digestarum: Per aream ubi pergimus ad alteram Ædificii partem ad Horti Introitum sitam accedimus, in cujus porticu variæ Effigies, ut Cæ-salpini, Clusii, Casauboni, Matthioli, Ponæ, &c. in perpetuam Clarissimo-rum Botanicorum Medicorumque memoriam suspensæ ex parietibus spe-ctantur. In superioribus conclavibus Antlia habetur pneumatica major, cum aliis quibusdā Instrumentis Phycis, ut & Furni cum suis Chymicis Instrumentis. Hortus ipse satis spatiosus est, non tamen exquisitè cultus, quem Hortulanus senex 1500 Plantarum, sed nullo fere ordine dispositarum, species alere mihi affirmabat. Interim rariores quasdam videbam alibi non observatas; imprimis oculum & animum meum delectabant,

Palma Dactylifera trium ferme virorum altitudine, fructibus onusta, qui rarò hic plenam maturitatem assequuntur. Myrtus latifolia Boetica se-cunda, vel foliis laurinis confertim nascentibus, C.B. Pin. Arbor hæc in nullis aliis Hortis à me visa, si arbor dicenda est, quæ multis stipitibus ex solo exsurgit ad duorum virorum altitudinem; Folia habet Aurantio Sinensi, Ferrarii, simillima; Fructibus referta erat majoribus ex nigro cæsiis. Hor-tulanus Africanam esse aiebat. Styrax folio Mali Cotonei C. B. Pin. pro-cera arbor fructibus maturis ornata. Ilex aculeata cocciglandifera, C.B. Pin. magnitudine spectabilis. Hujus Horti Catalogum quondam edidit Thomas Belluccius ejusdem Horti Præfectus, & Botanices Prof. Ord. Im-pressus est Florentiæ 1662. in 12mo.



Aquæductus Pisanus, qui limpidissimam aquam per quinque Milliaria Italica ad urbem ducit, visu dignus est, antiquus & temporis injurias ferens.

De famosa illa Turri inclinata hic saltem monendum duxi, ejus fundamentum in illo latere in quo inclinatur, mox in vel post erectionem subsedisse, hincque situm illum inclinatum, adeo decantatum, turrim, præter Architecti intentionem, acquisivisse, quod facile examinanti pater.

Elapsis aliquot diebus relicta Pisa, Lucam iter aggressus, primò transivi planitiem satis fertilem, & ob agros Moro, Lauro, Populo, Ficu, &c. cum annexa Vite circumdatos visu jucundam. Postea transcendendus erat Mons Sti. Juliani, ob Thymbram Montis Sti. Juliani dictam non ignotus, altus & petrosus, rarioribus nihilominus plantis ornatus; & in transitu præter dictam Thymbram varias observabam Cisti tam Ledi, quàm Maris, & Myrti species, Lentiscum nec non Ericæ & Sedi species aliquot. Ad montis pedem Lucensium incipit Jurisdictio, in qua mox sese Oculis nostris offerebant Oleæ olivis, quæ inter optimas numerantur, Castaneæ etiam, Arbutus & Terebinthus fructibus onustæ maturis. Tandem nova & fertilis planities vineis abundans ad Lucam usque Caput Reipubl. satis natæ. In hac parum quod Medicinam vel Hist. Nat. concernit vidi singulare. Hoc saltem observandum, me in hac Ditione, ut & in Hetruria, quamplurimos notasse agros Lupino vulgari semine albo, quo cocto homines vescuntur, confitos. Cæterùm ibidem & Ciceres, Milium, Sorgum, & Panicum in agris partim pro hominum, partim verò pro columbarum aliarumque avium usu coluntur.

Hinc per Pistoriam ad Hetruriæ Metropolin Florentiam iter meum direxi, ubi 17. Octobr. appuli. Innumera habet ampla hæc & elegans Civitas visu dignissima, ab \* aliis recensita, inter quæ Gazophylacium M. Ducis, quod *Galeria* appellatur, pretiosissimarum rerum arte factarum magno apparatu refertum, & splendidissimum Sti. Laurentii Sacellum M. Hetr. Ducum Sepulturæ dicatum, necdum perfectum, quibus cultissimos M. Ducis Hortos addas, facile primas tenent.

\* *Ristretto delle Cose più notabili della Città di Firenze, & al.*

Maxima tunc temporis Florentiæ ornamenta erant Celeberrimi per totam Europam Viri Laurentius Bellini & Antonius Magliabechi. Ille M. Ducis Archiater, in Medicina, imprimis Theoretica ejus parte, quod variæ ejus testantur Lucubrationes editæ affatim, versatissimus, & verè magnus Vir, in Praxi tamen (quod sæpius etiam in aliis observatum est) non adeo felix. Vir est parvæ staturæ, sexagenarius, variis morbis fractus, sinistri oculi à quinque jam annis Catarrhactâ laborans. Cum hoc de variis rebus Medicis mihi erat Sermo. Nihil statuebat esse in Medicina, quod ingenio & studio non possit expiscari, cùm omnia secundùm leges Mechanicas fiant, præter minimarum particularum & Elementorum figuras, hancque esse rationem, cur Medicina nunquam ad perfectionis culmen perventura sit. Aquæ Tetuzzianæ in Dysenterici curatione adeo decantatæ scaturiginem prope Pistoriam esse, me docebat, eamque continere Salem marinum sive commune, & purgandi vi præditam esse; hinc pauperibus aliquando Salem marinum in Aqua fontana solutum propinari, simili, licet non



non semper æquè felici cum succēssu. Ab annis jam aliquot sæpius vacavit Musicæ & Poesi, quas perditè se amare aiebat, continuis Meditationibus distractus.

Alter Antonius Magliabechi, M. Ducis ejusque Fratris t. t. Cardinalis Bibliothecarius, in Librorum cujuscunque generis cognitione ad stuporem versatus, unde eum non immeritò Vivam à Serenissimo Duce Bibliothecam salutari tradunt. Vir hic erga exteros humanissimus est, quod ipse satis superque expertus sum, cùm prima saltem vice ipsum in instructissima Bibliotheca Cardinalis, quæ in supremi Principis Palatio servatur, salutarem, ubi de variis libris me instruxit quàm lubentissimè. Inter Libros Medicos, ut & Hist. Nat. Scriptores, quorum magnus adest numerus, eminebat spissum Volumen in regali forma, vivas Plantarum Icones artificiosè suis coloribus expressas, additis Nominibus manuscriptis, continens, cui Titulus : *Viridarium Botanicum, in quo Arborum, Fruticum, Suffruticum, Stirpium, & plurimarum Plantarum tam indigenarum, quàm exoticarum Species latè virentes perennantur ; quas è diversis locis collegit & delineavit, coloribus naturam imitantibus pinxit, & celebrium Botanicorum Nominibus distinxit Josephus Baldius, Medicus, Physicus, Civis Florentinus, Academicus Apatista 1650.* Postmodum toties miratus sum, quoties vidi Celeberrimum Virum, præsertim in ædibus propriis, in quibus vix locum invenies, qui Libris replētus non sit ; adeo, ut, qui Libros ejus Elementum vocat, in quo degit, non à vero aberret.

Inter Bibliothecas, quæ pulcherrimam hanc urbem etiam Doctis commendant, non ultima est quæ Sti. Laurentii dicitur à Templo adjacente homonymo. Hæc non minus ob elegantem Architecturam, quàm famosissimo Michaeli Angelo Bonarotio debet, quàm imprimis ob insignia in omni Facultate MSS. ex quibus tota ferme constat, ferreis catenis uti in Bodleana Oxoniensium alligata, commendabilis. Inter Medica mihi maxime notabile videbatur vetusaliquot MSS. in Folio in membrana exaratum, cum figuris vivis coloribus expressis ad luxationes præsertim pertinentibus, sequenti titulo : *Chirurgia Hippocratis, Galeni, Oribasii, Heliodori, Asclepiadis Bithynii, Archigenis, Dioclis, Amyntæ, Apollonii Ther. Nymphodori, Ruffi Ephesii, Apollonii Citiensis, Sorani, Pauli Aeginetæ, Palladii.* Hoc MSS. ut me D. Magliabechi certiore fecit, transcripsit Jacobus Tollius, post cujus mortem eo jam potitur Hainius Professor Dusburgensis illud propediem publicaturus. Hic & Dioscoridis codex MSS. asservatur, in charta scriptus, qui tamen non admodum antiquus videtur.

Imprimis grata mihi hic fuit conversatio cum admodum Rev. Patre Brunone Tozzi, Monacho Valombrosano, cujus sanè humanitatem & in Botanicis peritiā satis deprædicare nequeo. Incredibilis est ejus in inquirendis Plantis diligentia, quam ob rem singulis annis Hetruscas Alpes perreptat, Plantasque collectas propria manu vivis coloribus quàm accuratè depingit. Promisit Catalogum Plantarum in Hetruria nascentium, cum non descriptarum Iconibus, quarum nonnullæ jam erant sculptæ. Ducebat me ad Nosocomium Stæ. Mariæ, quod Italiæ, si non totius Euro-



pæ; amplissimum dicitur, in quo ingens Ægrotantium numerus egregiè curatur. Vidi cum eodem etiam Laboratorium Chymicum M. Ducis, quod *Fonderia del Grand Duca* appellatur Italis, in quo quamplurima Præparata Chymica cum Furnis & Instrumentis servantur. Hic observabam modum conficiendi varias Essentias odoriferas per integram Europam ferè decantatas, quæ Essentia de Bergamotte, Cedro, &c. vulgo nominantur. Præparantur scilicet per distillationem (secus ac Romanæ Essentiæ, quæ per expressionem saltem fiunt) ex corticibus per Vescicam & Serpentinam, sola addita aqua communi, à qua post distillationem Oleum supernatans Essentia dictum separatur. Aquæ autem odoriferæ ex Floribus, hic absq; ullius aquæ additione distillari solent, & sunt excellentissimæ. Præter hoc Laboratorium Florentiæ quoque habetur M. Ducis Pharmacopœia, in qua inter rariora Monstrosi aliquot foetus in Sp. Vini servati, ut Lepus octipes, Caniculus biceps, Caniculus monophthalmos in fronte, & alii mihi demonstrabantur. Idem D. Tozzi mihi viam aperuit ad summe Rev. Abbatem Monasterii Ripolitani Valombrosæ Virgilium Falusium, multa ætate provectum, sed humanitate, & in Botanicum Studium amore, quod ejus Prosopopœia Botanica testatur, nemini secundum. Botanicis Hetruscis quoque annumerandus est D. Petrus Antonius Michaeli junior Bibliopola, supra nominati D. Tozzi amicus. Hic Rei Herbariæ studiosissimus, imprimis Methodi Tournefortianæ gnarus, qua adeo & non absque ratione delectatur, ut integras Tournefortii Institutiones Botanicas ipse ad septem circiter plagas in forma duodecima contraxerit, quibus tamen omnes figuras Tournefortianas genericas cum Nominibus & classium Inscriptionibus complectitur.

Antequam Florentiam relinquam, non possum planè silentio præterire elegantissimæ hujus Urbis dedecus, fenestras videlicet chartaceas plurimarum ædium, ut & Palatiorum nonnullorum, quas frequentiores adhuc Pisæ & Lucæ annotaveram. Miror sanè incolas aliàs in Ædificiis satis splendidos hac in re adeo esse negligentes; cum tamen Vitra ibidem non majoribus, quàm alibi sumptibus parari posse persuasus sum.

D. 30. Octobris me Romam contuli; transibam Senam linguæ Toscanæ puritate celebrem, postea & Montem Radicofani præaltum, ad cujus radices descendendo incipit Jurisdictio Papæ. Bolsena Oppidum est ad lacum ejusdem Nominis situm, ad cujus sinistrum latus via regia est Sylvæ quernæ adsita. Quercus hic solent esse humiliores, gallis majoribus referatæ, ut & excrementis illis, quæ Pilulæ capillatæ, C. B. Pin. Lobelio verò rectiùs Bedeguaris effigie excrementum spongiosum & muscosum. Frequens quoque Quercus calyce echinato, glande majore, C. B. Pin. à me observabatur. Montes erant saxei, multis in locis ex Basalte compositi, multis cavernis & specubus olim arte ut suspicor excavati. Monte-Viasconi dictum Oppidulum à Vino muscato optimæ notæ *Est, Est, Est*, adeo notum.

D. \* Mission inscriptionem Sepulchri non rectè notavit quam sequentem deprehendi :

\* Voyage à  
Italie.

EST.



EST. EST. EST. PPR. NIUM  
EST. HIC. IO. DEUC. D.  
MEVS. MORTUS. EST.

Viterbium Civitas est post Senam in hoc Itinere maximè notabilis & satis ampla Pontifici subjecta; ad cuius dextrum latus, cum Thermas reperiri Naturales, *Bulicanti*, i. e. bullientium nomine ibidem cognitæ, unum milliæ Italicæ distantes audivissem; eo mox me mea duxit curiositas. Inveni autem eas decliviori loco, in solo albicante arido & quasi calcario, odore sulphureo & fumo mox adeuntibus sese prodentes. Sapor quoque ad sulphureum admixta aliquali falsedine accedebat. Primariæ in loco aliquantulum elatiori sitæ, multis scaturiginibus ex terra propullulantibus compositæ, muro lapideo humili heptagonæ figuræ cingebantur, Balneum Regis Bathoniense magnitudine ferme adæquantes. In uno muri latere sequens saxo insculpta legitur inscriptio:

D. O. M.

Ars Ortulanorum

feci A. D. MDC.

Aqua est calidissima, ita ut manum, si paulo diutius in ea detineatur, comburat, & Ova brevi induret. Ex his 4 rivuli veloci cursu prodeuntes adjacentibus Thermis secundariis aquam largiuntur, sed caloris longè remissioris. Rivulorum fundus saxeus est, albus ex sedimento, aquæ calcario ortus, quo refertam esse stipites quoque Cannabini simili crusta lapidea & calcæria undiquaq; obducti, quos ibidem colligebam, testantur. Multis in locis concretum hoc sedimentum coloris est viridescens, quod aquæ quoque dictum colorem conciliat. Fere neglectæ mihi hæ Thermæ videbantur, quod tamen summopere mirabar, etiamsi internum earundem usum ob copiosè admixtas particulas calcærias nemini suaderem. Cæterum in Thermis hisce secundariis Cannabim macerare solent accolæ.

Remarks by  
Dr. Tancred  
Robinson in  
his Travels, in  
1683 and  
1684. n. 349. p.  
473.

VII. In my Journey from Rome to Naples I observ'd on the Rubbish of the *Tre Taberne* an unusual Vegetable for that place, remote from Town or House, which was the *Ficus Indica Spinosa* commonly call'd the *Opuntia* or *Tuna*, and by our Writers of America the *Prickly-Pear*, whose Juice gives the Urine a red Colour; when I came to Naples, I found it there near the Rocks, and in some wild solitary Places like a Native. If the Spaniards planted it, they chose desert Situations. On this Plant the *Cochineel Vermiculus* is said to feed in great Numbers, before it changes into the *Chrysalis* or *Aurelia* of a Lady-Cow: but the Colour lies in the *Nymph Worm* before it turns a *Beetle*. This gives me occasion to reflect upon the many Species of our *European Vermiculi*, some of which might be found to yield rich Colours (if try'd): We are certain the



the Maggot of our *Ilex* gives the *Kermès*, and a noble Scarlet Die before it turns into a Fly. Many Shell-Fish (which are a sort of Insect) contain Purple Juices. This brings on another Remark I made in passing the *Apennines* and *Alps*, where I noted in some Beds or *Strata*, and even in the midst of the hardest Rocks, great varieties of perfect Shells, that never occur'd to me on the *Italian* Shores, nor in any of the numerous *Museums* of that Country: so I guess they might be *Exotick*.

Going further on the *Via Appia*, I observ'd abundance of the *Silqua Arbor* or *Carob Tree*, commonly call'd *Panis S. Joannis Baptiste*; on the Pulp whereof many poor People were feeding. The Husks tasted like *Manna* to me. Near them grew plenty of the *Arbor Judæ*. The *Arbutus*, or *Strawberry Tree*, was common in the woody places; if this grows wild in the South West Parts of *Ireland*, as some affirm, I shall think them much warmer than any Counties of *England*.

Before I enter'd the beautiful *Campania* of *Naples* large Woods of *Cork Trees* grew on each side the Road, where the Inhabitants were decorticating them. I ask'd if the Trees did not perish: they answer'd, some did, but the Acorns return'd annual Supplies. The Women and Children wore Shoes made of the Bark.

Coming near *Capua* I observ'd a Species of Ash, or *Ornus*, on the Trunk whereof many Saccharin Concretions were visible. This prov'd the true *Manna*, that issues out thro' the Incisions made in this Tree by the Inhabitants of *Calabria*. Swarms of *Cicada's* were sucking the Body and Boughs, and perhaps by wounding them made way for fresh *Manna*. Here I may note, that many Insects have not only a *Proboscis* to bore and draw out the Juices of Plants for Aliment, but other proper Instruments to convey their Eggs into Vegetables and Animals, where they may find Covert and Food when they come to hatch, in the Gall-Tumours, and other Excrescences occasion'd by the Wounds of the Parent Insects, that make such variety of *Cuniculi* in all parts of Plants, and even in the cutaneous parts of living Creatures and in dead Flesh. This confirms me, that many Gums and Exudations find their way out of Vegetables thro' the Wounds of Insects and other Apertures. Most *Voyagers* thro' the *East Indies* affirm, that *Gum Lack* is work'd and made by large *Ants* that cover the Trees. I rather think the Insects suck and terebrate the Tree, and so give vent to that peculiar Sap that hardens in the Sun. This may extend to most Balsamiferous, Gummiferous, and Saccharine Plants, especially in hot Climates where Insects abound, and are more active. In cold Climates the Saps of many Vegetables will boil into Sugars, as that of Maple, Birch, Reeds, &c. Not but that the Fluids of Plants (like those of Animals) will spontaneously break thro' their Vessels in a Plethory, and make on the superficial Parts various Eruptions and Congestions. I may here take notice there are many adulterations of *Manna*: all passes for the *Calabrian*, whereas that of *Briançon* is from the *Larix*, that of *Persia* from the *Myrica*, and these frequently mixt



with the Juices of Spurges, and other Purgative Ingredients. I must not here deny that Dew will sometimes in cool Mornings shoot, and congeal into a solid, sweet, white Substance, which I once observ'd in very hot Weather before Sun-rise.

Upon viewing the *Vulcano's* about *Naples*, *Vesuvius* on the East side, the *Solfatara* and *Monte di Cinere* on the West near the *Puzzuolo* and *Bajæ*; I observ'd the same face of Nature, which I believe runs thro' all the other *Vulcano's* of our Globe, viz. heaps of Pumice Stones and Cinders of *Marchasites* on the sides, with Beds of Flower of Brimstone on the tops. The Holes and Cavities in those calcin'd Minerals seem to be the *Nidus* of the *Sulphur*, which hath been sublim'd by the Heat and Fire of that vast Mass of *Pyrites*, that compose the Bowels of those *Vulcano's*, and lie scatter'd thro many parts of the Earth, even under the Sea, where they sometimes germinate, ferment, and take Fire, throwing up little *Islands*. Earthquakes and other *Choc's* of the Globe may spring from the Mines of these combustible and explosive Minerals, loaden with Brimstone and elastic Salts. Hence some account may be given of *Thermae* or hot Baths, whose Waters gliding thro' these hot Beds take their *Gas*. Of such Medicinal boiling Waters and Stoves, there are more about *Naples* than in any place I ever saw or heard of, the whole Country being continually pervaded by hot Steams.

Walking round this City I found *Palm Trees*, some with unripe *Dates* hanging down, others without any Fruit; and there was another Species of *Palm* that sweats out the *Gum Dragon*: I suppose the Monks had transplanted them out of *Africa*. I saw growing here many *Sugar-Canes*, *Rice*, *Maiz*, abundance of the purging *Senna* and *Cummin* Seed. Thro' the whole *Campania* of *Naples* I observ'd the same Vegetables to be larger and more proud than in other parts of *Italy*, as the *Platanus*, the *Lentiscus*, the *Terebinthus*, the *Pistaches*, the *Oleanders*, *Agnus Castus*, *Barba Jovis*, the *Tragacanth*, the *Styrax*, the *Capers*, &c. The *Melons*, *Fujubes*, the *Azaroles*, and other Fruits were of a better Taste. The *Gossypium*, with the Cotton breaking out of the husks, adorn'd some of the Fields; the Hedges full of *Pomegranates*, *Almonds*, *Tamarisk*, *Sumach*, *Cedrus Lycia* (a sort of Juniper or Savin) abundance of *Phillyrea*, *Alaternus*, *Cisti*, *Cytisi*, *Myrtles*, *Spanish Broom*, *Bays*, *Laurustines*, &c. all wild, indigenous of that warm Soil and kind Climate. The *Water-Melons*, the *Olives*, the *Oranges*, *Lemons* and *Citrons* were better than about *Genoa* or in *Provence*. The *Lotus Arbor* or *Nettle Tree*, the *Paliurus* or *Christ Thorn*, the *Ricinus* or *Palma Christi*, common in the Hedges, with several *Thymelæa's*.

I saw them fishing for *Coral*, and *Hippocampi*: the first did not come soft out of the Sea; the hard Incrustation covers the vegetable part that bears Seed, as the *Alga's* and *Fuci* do. They take the *Sword-Fish* by darting a Spear into him, as they do the *Whales* in the *Greenland* Fishery.

When



When dark Night came on, I could see multitudes of Luminous Flies thro' the *Campania* of *Naples* : perhaps our Male-Glowworm, or flying *Cicindela*, may abound there ; not but that many other Insects may carry such Lanthorns about them. The *Scorpions* creep out about that time ; and I have found them often in Bed, with the *Punaises*. The Hedges are full of *Lizards* of various Colours ; and the *Cicada's* chirp and sing towards Evening. I observ'd several Species of stinging Spiders in the Corn-Fields, some of which, in hot Harvests, may prove *Tarantula's* ; the Poysons of Animals and Plants increasing with the approach of the Sun, and the Heats of Climates. Abundance of Silk-Worms were spinning on the Trees and Shrubs ; the Birds prey'd upon them, before they could change into *Papilio's*, as they do upon Swarms of *Locusts*.

I eat often their young Frogs, Tortoises and Snails, served up with Oyl and Pepper, which agreed well with me : so did their *Sea Urchins*, and the *Urtica Marina*, (called *Sea Felley* or *Blubber*, though it be an Animal having a true Heart, and Vessels for the Circulation of Fluids.) Some of their Thistles are no ungrateful Sallet. I saw some Vitriol Works about *Siena*, *Rome* and *Puzzuolo* ; those of *Alum* only about *Civita Vecchia*. Amongst the Sands of the *Adriatic* Sea I observ'd many white, clear, shining Flints ; which they told me were carried to *Venice*, to make fine Crystal Glass at *Muran*.

The Magnificent *Septizonium* figur'd by \* Dr. *Musgrave* stood near the Foot of the *Palatine* Hill, on the *E. S. E.* side, overlooking the *Via Appia* and the *Circus Maximus*, the *Amphitheatre* of *Titus* being near on the other Side. By the number of *Portico's* (which were Seven) it might contain Multitudes of People, as Spectators of the Triumphal Entries and the publick Games. But I would not be thought to differ from our *Learned Countryman*, who with good Authority, thinks it the *Sepulchretum* of that Imperial Family ; tho' most of the Ancient *Mausoleum's*, (at least those I saw) were *Rotonda's*, or *Columbaria's*, for the more convenient placing the *Urns* of the Kindred ; as that of *Augustus* near the *Campus Martius* ; that of *Adrian* on the other Bank of the *Tyber* ; those said to be of *Scipio*, of *Cicero*, and *Munatius Plancus*, near *Gaieta* and the *Via Appia* ; that of *Virgil* on the side of mount *Pausilippus* ; that of *C. Metella* and some others on the *Via Flaminia*. Some were Pyramidal, as that of *Cestius* in the Wall of *Rome*, and a few others on the publick Roads. This *Septizonium Severi* seems to differ from the rest of those Ancient *Sepulchretum's*, which might be varied according to the Fancy and Humour of great Families. This Urn Burial was only in Fashion amongst the *Gentes Majores* : as for the dead Bodies of the *Plebeians* and Slaves, they were generally laid in places where they had dug Stone ; and those Quarries became *Catacombes*. The Laws prohibited them to bury within a City, unless the Bodies were first reduc'd to Ashes.

\* Geta Britannicus.

I observ'd in many of the Ruins about *Rome* and *Naples*, great Stones laid close, and wedged very fast with little or no Cement ; the Bricks, to-



wards the middle of a Building, were generally of a *Rhomboidal* Figure, very Smooth, Shining and Hard, laid in Plaister as firm as Marble. Their Mortar was much more durable than ours, as appears at this Day by their *Aqueducts* and *Piscina's*, the *Cento Camare*, and *Caligula's* Bridge under Water at *Bajæ*. *Pliny* says, they made use of the *Terra Puteolana*, but the present Inhabitants have lost the way of tempering it.

During my abode at *Genoa*, *Leghorn*, *Ostia* and *Civita Vecchia*, I observ'd many *Torpedo's* or *Cramp-Fishes*, most accurately Anatomized by *S. Lorenzini*; plenty of *Sphyræna's*, (a Species of a Sea-Pike, a-kin to the Needle-Fishes.) The *Uranoscopus*, call'd *Bocca in Capo* and *Prete*. The *Mola* or Sun-Fish. The *Dentex* or *Pentalis*, *Altavela's* a sort of *Pastinaca*. The *Pesce Balestra* or *Capriscus*. The *Pesce Pettine* or *Novacula*. The *Zygæna* or Ballance Fish, as large as the Saw-Fish or most Sharks. The *Scolopax* or *Trombetta*, call'd by our Seamen the Bellows or Trumpet-Fish. The *Draco Marinus*. The Tunny-Fish. The *Centrina* or *Pesce Porco*. The *Aquila*. The *Scorpius Major*, with Varieties of *Turdi* in the Markets. But what pleas'd me most, were some odd Sea Animals, as the *Lepus Marinus*, (a Species of naked Snail) the *Hystrix Marinus*, or *Eruca*, call'd by the Seamen *Pincio*, with a Brush hanging out of the Tail, like the *Byffus* or Silk of the *Pinna*. Many *Tamburo's* or Drum-Fishes; Plenty of *Muræna's*. I observ'd a strange Sea-Animal, call'd the *Microcosmo marino*, with many Shells, *Tubuli* and Vegetables growing or sticking to the Back of it; this appear'd to me a-kin to the *Echini Marini*, or rather the *Stellæ Marinæ*, being Triangular, and sometimes *Pentadactylous*.

I embark'd once with the Fishermen, who shew'd me several *Loligo's*, *Polypi*, and *Sepia's*, or Cuttle-Fishes, (all *Crustaceous*) some of them were casting out their Ink in the Water: I supposed some Sharks, Dog-Fishes, or other Enemies, were near them; this black Liquor may be in the Gall of those Animals. In the Nets, I often found Sea-Insects, and Vegetables; and indeed a new World, undescrib'd by natural Writers, at least unknown to me: but for want of the Art of Designing or Drawing, abundance of things escap'd me, and were utterly lost; therefore I would advise all Travellers to be conversant in that most useful Science.

I observ'd the *Italians* near the *Alps* and *Apennines*, call'd several Birds *Francolino's*, as our Red, Grey and Black Game; and even their red and white Partridges; the different Colours of the Hens from the Cocks, the many Variegations in Feathers, the different Ages and Places, have all given occasion to multiply Names and Species; the same may happen in Fishes, Quadrupeds, Insects, and all the Divisions of *Zoology*; and even in *Botany* and *Mineralogy*. The *Italians* call many of their little fat Birds *Beccafigo's*, that feed upon Figs, Grapes, and other sweet Fruits. So the *French* multiply their *Ortulans*, taken in the Vineyards and Gardens. Some of the Ancient Writers take notice that the *Romans* used to feed their Geese and other Birds with Figs, when they intended to swell their  
Livers



Livers to a monstrous Bigness. The *Merops* or *Apiaster* is common on their Brooks; it flies like our Kings-Fisher, and preys not only upon Insects but Fish. There is a very beautiful Bird in *Italy*, that suspends its Nest down from the Boughs of Trees. When I saw it fly by me, I took it for an *Indian*, from the Brightness of its Colours; it is as large as our Missel-Bird and Thrush, an *Icterus Plinii*? The great Cock of the Wood (said to be found in *Ireland*) is common on the sides of the *Italian Hills*, and brought frequently to the Markets. I saw twice or thrice the *Himantopus*, and the *Phœnicopterus* or *Flamingo*, (whose Tongue was a Dainty amongst the *Romans*, when they grew Luxurious.) I observ'd some *Spoon-bills*: these three last Birds were wading in the Rivers and Marshes, near the Sea. Once I spy'd some *Pelicans* on the *Adriatick*, near the mouth of the *Po*. The *Avis Diomedæa* was hung up dry'd in one of the *Museums* at *Florence*, but they told me it had been taken on some of the Isles of the *Archipelago*. On the *Laguna* of *Venice*, I saw several Species of *Mergi*, *Lari*, *Colymbi*, and other Water Fowls, most of which Div'd. I was surpriz'd with the Variety of them, having not seen so many on other Coasts: perhaps the hard Winter had forc'd some unusual Birds thither. The Monks and Fryars told me, they eat some of those Sea-Birds in *Lent* and on Fast-Days, because they liv'd upon Fish, and had a piscose Taste, as the *French* pretend their \* *Macreuse* to have, which is a sort of Sea-Duck, common on the coast of *Normandy*, and brought to the Markets, even at *Paris* on *Maigré-Days*.

\* Phil. Transf.  
n. 172. p. 1036.  
Abr. Vol. II.  
p. 850.

*Buffalo's* are common in the Kingdom of *Naples*, and in some parts of *Lombardy*, where they plough and draw with them. A peculiar Cheese is made of their Milk (call'd *Casio di Cavallo*) rowl'd up like stiff pieces of Ribbon. Out of their black shining Horns they make Snuff-boxes and Combs. The Creature is unruly, and therefore they lead them with Iron or Brass Rings drawn thro' their Noses. They make a Buff-Leather of their Skins. I once saw some hairy Sheep feeding on a Common; perhaps they had been brought from *Africa*. In passing the high *Alps*, I had a View of the *Ibex* or *Steinbock*, whose large Horns are recurvated almost as far back as the Tail; they are very ponderous for the Bulk of the Animal, having many knotty Rings, that may help them in climbing. They are rarely taken. The *Rupicapra* or *Chamois*, is very common on the sides of the Cliffs, whose Skins afford the soft Leather. The *Mus Alpinus*, or *Marmota*, is as large as a Rabbet, will soon grow tame in Houses, tho' brought down from the Summits of the highest Mountains, where it will grow fat.

I have seen in several Town of *Italy* fresh strong *Porcupines*, which the Inhabitants told me were taken in the Hedges and Ditches thereabouts, tho' much more rare than our Land-Urchins. In the *Grisons* Country, and in some Cantons of *Switzerland*, I have often observ'd the *Ranunculus Viridis* or small Tree-Frog, perching on the Boughs and Leaves. In the Northern Parts of *Germany* I saw several *Elk-Skins*, and those of the  
Rhine-



*Rhin-Deer* stuffed, and set up in *Museum's*, but never alive: tho' the Animals are said to be common in *Muscovy* and *Lapland*, and sometimes seen in the Forests of *Prussia*. The Skins of *Hippopotami* (said to be the *Behemoth*) are in some Collections of Curiosities in *Italy* and *Holland*: so are those of the *Musk-Deer*, one of which is in the *Museum* of our *Royal Society*.

Remarks in a  
Journey in-  
to Denmark  
and Holland  
by Dr. Oliver,  
n. 285. p. 1400.

VIII. The Colleges and Schools in *Copenhagen*, both as to their Structure and Foundations, are very ordinary: The best I saw there was the Gift of the Learned *Borichius*, and consists of twelve Apartments for as many Students, which are conveniently provided with Stoves for their manner of living in that cold Country. There is in it a small School for publick Exercises, and a little Library belonging to their College; the rest of the Students, except one hundred maintained by the King in small Colleges, live at Lodgings in the City, as at *Leyden*, and other Universities abroad, who, when the *Swedes* threaten'd them with a Bombardment in the Year 1700, formed themselves into a Batallion, and did Duty there, all the while the Enemy was on the Island of *Zealand*. There are in this University, erected about two hundred Years ago, about a thousand Students, and sometimes they have had near fifteen hundred. The University Library, over one of their Churches, in one large Room, consists of several Libraries, the Gift of particular Men which are kept apart, with the Benefactors Names over them in Capital Letters. The Royal Library, belonging to the King, consists of a great Variety of Books, well condition'd and well chosen, of all Languages; the Books of each Country being placed by themselves: The Room is large and well built, and has a large Gallery supported by Pillars on each side. If *Gudius's* Library at *Gluckstadt* be added to this, as I was told it wou'd, this Library may be reckon'd of the first Rank of the *European* Libraries.

The Kings Chambers of Rarities are in all eight, large and well built over the Royal Library: They are furnished with great Variety of Natural and Artificial Curiosities. The first contains Coins and Medals, Gold and Silver; Modern and Antique; *Grecian*, *Roman*, *Danish* and *Oldenburgh*; besides other *European* Nations, distinctly kept by themselves, which make altogether a very valuable Collection. Amongst the Natural Curiosities which are in the other Chambers, the most remarkable are;

\* Hist. Anat.  
Paræus, Li-  
cetetus de Mon-  
stris, &c.

I. The Petrified Child: This is the same Child that \* *Bartholine* makes mention of. This happen'd at *Sens* in *Champaign*, anno 1582, when it was Cut out of its Mothers Belly, where it was supposed to have lain about eight and twenty Years. That it's an Humane *Fœtus*, and not Artificial is visible to our Eye. The upper part of it is of a Gypseous Nature, not so hard as the lower, the Thighs and Buttocks being hard and perfect Stone as can be, of a Red Colour, and of a Grain and Superficies exactly like those I have seen taken out of the Bladder. I had the Curiosity to have it near me; and touch'd and felt it all over. This was convey'd



vey'd first to *Paris*, and there bought by a Goldsmith of *Venice*; from whom at *Venice*, *Frederick* the Third, King of *Denmark*, purchas'd it, and added it to his Rarities.

2. Two Elephants Teeth, that weigh 150 Pounds apiece.

3 Several Heads of Hares, with divers sort of Horns, brought out of *Saxony*.

4. An Egg, said to be laid by a Woman, of the ordinary size of a Pullets Egg. This \**Ol. Wormius* tells us was sent him by very good Hands, and \**Mus. Worm.* confirm'd by People of Credit: He tells us, the Woman brought forth <sup>p. M. 312.</sup> two, with the usual Child-bed-labour Pains; her Neighbours being call'd <sup>Joh. Rhod.</sup> in to her Assistance, the first they broke, and found a Yolk and a White, <sup>Cent. 3. ob-</sup> as in that of a Hen; the second was kept and sent to him. <sup>serv. 57.</sup>

5. The Horn of a Sea-Unicorn, or *Monoceros*, so called by the Learned, because supposed to have but one: But sometimes more are found to grow out of the upper Jaw; and I was credibly informed at *Copenhagen*, that one *Koens*, a *Hamburger*, brought home from *Greenland* the Head of one of these with two Horns on it. And when I saw this, and examin'd it well, I found this Horn (part of the Head and upper Jaw being brought home with it,) not to grow out of the Middle, but Left side of the upper Jaw; so that 'tis probable there was a fellow, and then they may be said more properly to be his Teeth or Tusks than his Horns: Whether this was only a *Lusus Naturæ* or no, or naturally these carry only one Horn, as they are represented in the Cuts and Figures our Naturalists give us of them, I shall not determine.

6. Several Pieces of Gold-Oar very rich, and some almost fine, dug out of the Mines of *Norway* and *Hungary*.

7. Several large Pieces of Silver-Oar, dug also out of the Mines of *Norway*, one of which weigh'd five hundred and sixty Pounds, *anno* 1666, five Foot and six Inches long, and four Foot about, valued at five thousand Crowns: Another from *Norway*, also valued at three thousand two hundred seventy two Crowns. I observ'd a great many Silver Threads or Trees sprouting out of these two Pieces, and fancy the whole Mass had not above a fourth part of any baser Metal, Mineral or Earth mixt with it. There are several of these Silver Ramifications or Trees, all from *Norway*, which I take to be Virgin-Silver and pure Metal.

8. A great variety of very large pieces of Amber; some dug out of the Island of *Anaker* near *Copenhagen*, and some when they were opening the Ditches for the Fortifications of *Copenhagen*: Some of these weigh about forty or fifty Ounces, and were found every where sticking fast to pieces of black Timber like Ebony.

9. A numerous Collection of very large Branches of Coral, white and red, and one black.

10. A large pair of Stags Horns growing out of a piece of Wood, after a very strange manner.



11. Another Branch of a Stags Horn, with a large piece of Wood naturally adhering to the top of it; the top of the Horn piercing the very body of the Wood, and growing some Inches beyond it.

12. A Sheep, with a Horn growing out of its side about a Foot long.

13. I measured the Thigh-bone of a human Body, I suppose, that was three Foot and three Inches long; the Head was two Foot and five Inches round, and the middle of it was nineteen Inches and an half about.

14. Two very large Scollop Shells, that weigh two hundred and twenty four Pounds each.

15. A piece of Marble, with a natural Representation of a Crucifix on its outside, mightily valued by the *Lutherans*. And I remember Dr. *Hartman* shew'd me at *Koningsberg* in *Prussia*, a piece of whitish Amber, having a Woman with a Child in her Arms, prettily represented by variety of Colours on the Superfice; I suspected it to be artificial, but he assured me the contrary, and kept it very religiously.

There were besides these a great many more natural Rarities, which my short stay there would not permit me to examine.

Among the Artificial Curiosities, I observ'd,

1. A Skeleton made of Ivory in imitation of a human Skeleton, two Foot and six Inches long, so artificially and curiously put together, that any one well skill'd in Osteology may take it for a natural one.

2. Two Crucifixes of Ivory, with the whole History of our Saviour's Passion, extremely well carved and express'd, and are both a very pretty Curiosity. I saw there a great variety of Nicknacks made of Ivory, curiously wrought on the outside: A small Man of War of Ivory, with silver Guns in it; several small Sloops and Galleys of the same, and one of the Unicorns Horn, with a gold Anchor.

3. A Watch made of Ivory, with all its Wheels and Motions. Several other Utensils made of Ivory and Unicorns Horns, prettily carved and turn'd: Besides some others of Ebony, Heart-Oak, Box, Amber, Silver, Brass, &c. which are kept together for the Curiosity of the Workmanship.

4. In another Chamber there is nothing but the Garments, Arms, and Utensils of *Indians*, *Turks*, *Greenlanders*, and other barbarous Nations, which for their number and variety entertain the Eye with a very agreeable pleasure.

5. A Perspective of the late King of *Denmark's* Family, the Queen's Face being in the middle, and eight Princes and Princesses round her, yet all club to make the Face of the King, thro' a hole of a glass Tube.

6. Six golden sepulchral Urns, found in the Island of *Fuenen*, Anno 1685, by a Boor there, as he was plowing his Land; they were full of Ashes or a greyish Earth when found. The biggest is two Ounces and



an half, the other five about two Ounces and a Drachm. This confirms the accounts given us by *Saxo Grammaticus*, *Olaus Wormius*, and others, that it was a very ancient Custom among the Northern Nations to burn their Dead, and then bury their collected Ashes in golden Urns. They were very thin, and had three Rings of Gold round their Necks, and several Circles one within another, with one common Center carv'd on the outside round the body of the Urn. They held between four and five Ounces of Liquids.

7. Another sepulchral Urn of Crystal, of a conical Figure, found near *Bergen* in *Norway* about thirty Years since, with a gold Wire about it, that weighs eight Ounces.

8. I saw in another Chamber several *Urnæ Lacrymales*, in which were collected the Tears of Friends, which afterward the old *Romans* mix'd with the Ashes of the Dead: These were some of Glass, and some of Earth, and of several sizes. Brass Lamps of several Magnitudes and Shapes; some of other Metals, others of Earth, in the Shape of Animals or Idols, that were worshipp'd by the Ancients. The *Stilus Æneus* of the *Romans*, the one end sharp, the other blunt, the first to write with, the other to rub out what was written.

9. The large *Danish* Horn of pure Gold, weighs 102 Ounces and an half, is two Foot and nine Inches long, and holds about two Quarts of our Measure: This Horn was found *Anno* 1639, accidentally by a Country Girl in the Diocese of *Rippon* in *Jutland*: 'Tis no doubt, some *Runic* piece of great Antiquity by the Figures carv'd on the outside, which seem to be Hieroglyphicks, monstrous Shapes of Devils, Hobgoblins, &c. perhaps some of these might represent their Gods, and probably this Horn was used in their Sacrifices, as of old among the *Assyrians* and other ancient Nations, who were wont on solemn Occasions to entertain the Croud with mighty noises of Horns and Trumpets, or rather to drink out of at their solemn Treats.

10. The *Oldenburg* Horn of pure Silver, gilt with Gold, and variously enamell'd with green and purple Colours, and weighs about four Pounds. The *Danish* Antiquaries say this Horn was given to Earl *Otho* of *Oldenburg*, *Anno* 989, but by the Workmanship of it 'tis plain it cannot be of that date; for the Figures and Characters engrav'd and emboss'd on its outside are modern; which, with the Enamelling and other Ornaments, all curiously done, please the sight mightily, and make a very fine, as well as valuable Curiosity. I found in the same Chamber a great many Horns of this kind, some in Metal, some of *Bullocks* Horns tipp'd with Gold about the Edges, others of *Ivory*, *Unicorns* Horns, &c. all prettily wrought on the outside with a great variety of emblematical Fancies, according to the humours of those Countries and Times they were made in; which were so many Cups to drink out of at their solemn Entertainments; and this of *Oldenburg* was finer than the rest, because design'd for the Royal Table. 'Tis said to be made by the Command of



*Christian* the First, who lived in the fifteenth Century, and did it in honour of the three Kings of *Cullein*.

I went one day ashore on the Island of *Weenen*, which our Sailors call *Scarlet Island*, from a Tradition, that *Queen Elizabeth* offer'd as much Scarlet Cloath for it as wou'd cover it. This Island is now an appendix to *Schonen* in *Sweden*, not above half a League from the main Land. Here I observ'd the Ruins of *Tycho Brahe's* Castle, which he built on this Island, given him by King *Ferdinand*, who supplied him with Money for the carrying it on in the Year 1567. This Castle was built in the middle of the Island, but is now demolish'd, and quite raz'd to the Ground, and all the Vaults and under-ground Works fill'd up except the large Observatory, which \* *Gassendus* tells us, was distinguish'd from all the rest of his Apartments under-ground, that were very many, by a solid round Stone Wall, part of which remains still. This was his great Observatory, and was call'd by him *Stellæburgum*, or the City of Stars; as the Castle was *Uraniburgum*, or the City of the Heavens. The Situation was pleasant no doubt, it being on a very little rising ground, in the middle of a plain Island, not above three Miles round. The same Author tells us, the King of *Denmark's* Liberality was so great towards this learned Man, that the best Workmen were employ'd about it, and every thing well contriv'd both for Pleasure and Conveniences of Room; for Instruments and astronomical Observations above and under-ground, besides noble Gardens, Fish-ponds and a Park: But by the Fate of War between *Sweden* and *Denmark*, sometimes one being Master, and sometimes the other, of this Island, no one Stone is left of this magnificent Superstructure. His Instruments, that were very fine, are now scatter'd up and down in *Germany*, and some few remain in *Copenhagen*; his own celestial Globe I saw there in the *Rown* Tower, which was six Foot and three quarters in diameter.

\* In Vit.  
*Tych. Brahe.*

This Tower was built 1601, for the making astronomical Observations, near the Royal College in *Copenhagen*, and is above 150 Foot high, whose *Area* on the top is sixty Foot diameter: The passage up to it is large enough for two Coaches, and the Ascent so easy and hardly perceivable, that it serv'd for a place of Parade for their Gentry, when they had a mind to take the Air in their Coaches, riding up to the top, and so round the Ring, as well as for an Observatory. But Monsieur *Romer*, the great Mathematician and Astronomer of the present Age, has converted the upper part of this Tower now to other uses, where in a dark Room he has his Instruments for observation. Here I saw his Machine for observing the Stars by day: There is a Pole eight or ten Foot long, erected perpendicular in the Center of an equinoctial Plain; on the top of this Pole is fasten'd a Telescope, not much above three Foot long, which runs thro' the Roof of the Chamber, whose Elevation is directed by an astronomical Dial upon the equinoctial Plain, with an Index fitted to it for that purpose, which determines it to the Star he has a mind to observe



at any time. He is said to be the Inventer of two other Machines of great artifice and use: By the one he will shew at any time the Station of any Planet, according to the *Copernican Hypothesis*; by the other he will demonstrate all the Eclipses of Sun or Moon past or to come.

There is besides all these, in the King's House in the Garden at *Copenhagen*, a Royal Throne all of Unicorns Horn, on which all the Kings of *Denmark* are seated at their Coronation; but this, when I was there, with the rest of the Regalia, was secured and carried away, because they wou'd have been too much exposed had the King of *Sweden* bombarded this Town, as it was fear'd, when he landed on the Island, being but a little within the Wall towards the Land side.

In the Year 1685, I was at *Koningsberg* in *Prussia*, where I saw the Knife which was swallow'd by a *Prussian Boor*; who being Crop-sick one morning, thrust the Haft of his Knife down his Throat, in order to make himself discharge what offended his Stomach; but forcing the Knife too far, it slipt down his Gullet into his Stomach: from whence it was taken out by an Incision on the left side, a little below the short Ribs, with that success, that he lived several Years after it in very good health. This happen'd in the Year 1635. The Operation was perform'd by Dr. *Daniel Swab*, a Physician and Surgeon, and the Knife is kept in a velvet Bag in the King of *Prussia's* Library, where I saw it. I measured it by an *English Foot Rule* I had then in my Pocket, and found it to be of our measure but six Inches and about an half long, as 'tis express'd in the Cuts given us of it. I made enquiry concerning it, and was very well assured by several People of the Town the matter of fact was true; and 'tis hard to think, the King of *Poland*, who was then at *Koningsberg*, the Government of the City, and the College of Physicians, who were consulted upon the Operation, and, together with his *Polish Majesty*, were Eye-witnesses of it, shou'd by the Certificates they have publish'd of it in Print, contrive to impose a Cheat upon the World. And I remember, talking one day with one Mr. *Taylor*, a *Scotch Merchant* in *Koningsberg*, he told me, that *Andrew Grunbeide*, for that was the Man's Name, was his particular Friend and Acquaintance; that he saw his Wound several times when his Surgeons dress'd him, and was Godfather to one or two of his Children after his Recovery.

When I was last in *Amsterdam*, I had the curiosity to go to a Tavern, where the Master was very curious in Birds, and had a great variety of some very uncommon ones; amongst which, in a Chamber by it self, he shou'd me a Cage with a Bird in it a little bigger than a Capon, which he valued as a great Rarity, and told me it cost him near one hundred Pounds Sterling: He takes a Groat from every body that is admitted to see it. I must needs say I never saw a more beautiful Creature in all my Life; in Body somewhat like a Hawk, but its Head and Neck bald like a Vulture, only a few short Feathers over his Eyes like Eye-brows, his Eyes were pretty large, and the



the *Iris* of a very fine bright Pearl Colour, which gave great Beauty to this Bird. The Colour of his Feathers is so curiously mixt with that Variety that no Painter can imitate them, and entertains the Eye with a great deal of Pleasure: His Bill and Head in shape are more like the Eagle than the Vulture, tho' I take it to be of the Kind of the latter, but of the lesser sort. This Bird came from *Carthagena* in *America*, and may be describ'd thus: *Vultur Americanus minor Carthagenæ Corpore eleganti & plumis admodum concinne variegatis*. I presume this Bird can hardly be of the same Kind with those Vultures *Monardes* tells us of in the Islands near *Lima* in *Peru*, that prey'd on their living Cattel in the Fields, if not carefully watch'd by their Keepers.

I did not see the Cherry-stone in the King of *Denmark's* Cabinet, which I was told had some hundreds of Heads engraved on the outside of it; but I remember an *English* Gentleman shew'd me once in *Holland*, in the Year eighty seven, a Cherry-stone of this Kind with an hundred and twenty four Heads on the outside of it, so that you might distinguish with the naked Eye, Popes, Emperors, Kings and Cardinals, by their Crowns and Mitres. 'Twas bought in *Prussia*, where it was made for three hundred Pounds *English*, and is now in *London*, there having been a Law-suit not long since commenc'd about it in *Chancery*.

Of the Bramines in the East-Indies, by Mr. John Marshall, n. 268. p. 729.

IX. The Priests, or *Bramines*, and Holy Men, whom they call *Jogees*, when they have Occasion to write any thing they always put a Figure of one in the first place, to shew, as they say, that they acknowledge but one God, who they say is *Burme*, that is, Immaterial. When they preach to the People, and instruct them, which is commonly every Feast-day, Full Moon, or the time of an Eclipse of either Luminary, they tell the common People much of God, Heaven and Hell, but very Imperfectly, Obscurely, and Mystically. They say that when God thought of making the World, he made it in a Minute. They account this World the Body of God, for all that they say he's Immaterial; and say that the Highest Heavens are his Head, the Fire his Mouth, the Air his Breath and Breast, the Water his Seed, and the Earth and the Foundations thereof his Legs and Feet. But assert in general that God is the Life of every thing, yet is the thing neither greater nor less for him. They hold that God dwelt in a Vacuity before that he created the World, and that as he dwelt in that Vacuity he created several Beings out of himself, the first were Angels, the second Souls, the third Spirits, all differing in Degrees of Purity, the first being more pure than the second, and the second than the third. The Angels, they say, neither act Good nor Evil, the Souls either Good or Evil, but the Spirits, or *Dewta's*, as they call them, act scarce any thing but Evil.

They have a good Opinion of the Angels, and think their State mighty happy, hoping that when they die they shall be made Partakers of the same Bliss and Pleasure. They believe that every thing that hath Life hath a Soul



Soul, but especially Man; and they accordingly affirm, that as these Souls behaved themselves in their pre-existent State, so are their Actions in this World either good or bad, by a sort of fatal Necessity, which is very hard to conquer, or to overcome. Hence it is, say they, that there are so many different Humours and Dispositions of Men; for their Souls, before their Entrance, into their Bodies, being tainted with different Affections, causes the like Differences in the Parties, whose Bodies are their Vehicles. So that if a Man happen to have a sudden or unfortunate Death, they immediately ascribe the same to the Party's own Wickedness, or the bad Life that his Soul led before that it enter'd into his Body. For, say they, the afore-acted Evil that his Soul did in its other Life, brought these Accidents upon him, by getting the upper hand of him, and by being too powerful and strong. And those that dye thus, they believe that their Souls turn immediately into Devils. They maintain *Pythagoras's* Transmigration, or *Metempsychosis*, but in a grosser Sense than he did. For they believe that Mens Souls, that have not lived so well as they ought, go as soon as the Body dyes not only into Birds and Beasts, but even into the basest Reptiles, Insects and Plants, where they suffer a strong sort of Purgation, to expiate their former Crimes: But as for the Souls of the *Jogees*, or *Fuche's*, that is, of Religious Men and Saints, they fancy that they go and inhabit with the good *Dewta's*, or Angels, amongst the Stars. As for the Spirits, or Inferiour Angels, they believe that they are very evil, and have a hand in all Wickednesses, Murders, Wars, Storms, and Tempests; so that when they solemnize the Funerals of those that are dead, they alway present Dishes of Meat, as Offerings unto those Spirits, and sometimes sacrifice unto them, that they may not hurt the Souls of the Dead.

As they acknowledge the Being of a mighty God, so they hold that he created the World, and every thing therein. They believe that there are almost infinite Number of Worlds, and that God has oftentimes Annihilated and Re-Created the same. But how he came first to create the World and Mankind, they relate to have been thus—Once on a time (say they) as he was set in Eternity, it came into his Mind to make something, and immediately no sooner had he thought the same, but that the same Minute was a perfect beautiful Woman present immediately before him, which he called *Adea Suktee*, that is, the first Woman: Then this Figure put into his Mind the Figure of a Man; which he had no sooner conceiv'd in his Mind, but that he also started up, and represented himself before him; this he called *Manapuisse*, that is, the first Man; then upon a Reflection of these things, he resolv'd further to create several Places for them to abide in, and accordingly assuming a subtil Body, he breathed in a Minute the whole Universe, and every thing therein, from the least to the greatest.

They constantly believe that the Universe cannot possibly last longer than seventy one *Jooogs*, which is a Measure of time with them, and  
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is . . . Years. Which when it is come, God does not only annihilate the whole Universe, but even every thing else, as well Angels, Souls, and Spirits, as Inferiour Creatures; and then he remains in the same state that he was in before the Creation; But say, that after he has a while respired thus, he breathes again, and every thing is Created afresh, as well Angels and Souls, as all other things; but as for the Spirits, they are no more thought of. Yet for all this, after seventy one *Joogs* more all is annihilated again. How many *Joogs* are past since the World was last created they cannot certainly tell; only 'tis observable that in an Almanack of theirs, written in the *Sanscript* Language in 1670, they make the World then 3892771 Years old from its last Creation.

The *Bramines* of *Persia* tell certain long Stories of a great Giant that was led into a most delicate Garden, which upon certain Conditions should be his own for ever. But one Evening in a cool Shade, one of the wicked *Dewta's*, or Spirits came to him, and tempted him with vast Summs of Gold, and all the most precious Jewels that can be imagined; but he courageously withstood that Temptation, as not knowing what Value or Use they were of: But at length this wicked *Dewta* brought to him a fair Woman, who so charm'd him, that for her sake he most willingly broke all his Conditions, and thereupon was turned out. They tell a great many Stories, absurd and ridiculous enough, of the first Ages of this present World, which would be too tedious here to take notice of; only I shall here give you out of one of their own Books what they tell us of a great Flood that formerly happened. They say that about 21000 Years ago the Sea overwhelmed and drowned the whole Earth, except one great Hill, far to the Northwards, called *Bindd*, and that there fled thither only one Woman and seven Men, the Names of whom were, *Dehoolah*, *Sunnuk*, *Sunnaud*, *Trilleek*, *Sannotah*, *Cuppyloshaw*, *Suraschah* and *Burroopung*; these, understanding out of their Books that such a Flood would come, and was then actually coming, prepar'd against the same, and repair'd thither; to which Place also went two of all sorts of Creatures, Herbs, Trees, and Grasses, and of every thing that had Life, to the Number in all of 1800000 living Souls. This Flood (say they) lasted 120 Years, five Months and five Days: After which time all those Creatures that were thus preserved, descended down again and replenished the Earth: But as for the seven Men and Woman, only one of them came down with her, and dwelt at the Foot of the Mountain, the other six turned *Fuchee's*, or holy Men, and spent there the Remainder of their Days. They hold in general the *Ptolemaick* System of the Universe, and say that there are eight or nine Heavens, counting the Air and Earth, every one exceeding another in Beauty and Glory. Their Religion consists of nothing that I could ever see or learn, but the leading of a pure Life, the washing away of their Sins in the River *Ganges*, their muttering over of diverse Prayers, and their doing of strange and incredible Penances. They say, that God is such a one, that whosoever seeks him, let it be after what manner he pleases,



pleases, whether by thinking that the Sun is he, or the Moon, or the like, if they do it but sincerely and honestly, with a right affected Heart, they shall be received of him. They report, that on a time a *Mussulman* seeing a *Hindoo*, or Pagan Priest, in Heaven, he ask'd God how that Infidel came to have Admittance thither; whom *Mahomet* so often calls by the Name of Bitter Roots? To whom God answer'd, What if a Bitter Root bring forth sweeter Fruit than any of you, why should I not receive it? Upon which the *Mussulman* had no more to say. They hold, that such as suffer not their Minds to wander after the Lusts of the World are perfect *Jogees*, or Saints, and hold that God is always present with them in all their Actions.

It is to be found in many of their Books, that there was a time, a good while ago, in which God took upon him the Shape of a Man, and spent many Years in reforming the World, and giving better Rules to walk by than had been before: but at length having left them, they soon forgot him and his Rules, and return'd to their former Courses; upon which he told them that he would leave them to their own Ways, and never undertake any such thing again.

The Religious at some certain Seasons of the Year come unto the River *Ganges*, (which they call the Holy River,) in vast Multitudes, even from many Parts of *Tartary*, to wash away their Sins, and make Expiation for their Faults. This *Ganges* is a delicate fine River, chiefly for the sake of its most sweet, pure, and clear Waters, which have got it the greatest Esteem of any River in the East. I have oftentimes sail'd many Miles up it, and have found it in some Places not to be above a Mile broad, in others not half so much, and in one or two Places not above one eighth of a Mile. In *April*, when the Water is at the lowest, it is almost dry in many Places; but when it is at the highest, which is commonly about the middle of *September*, it is very deep, and many Miles broad. When the People are here gather'd together, they have a great many strange Customs and Ceremonies, and pay a Kind of Divine Honour and Worship to the River, too long and tedious here to mention. The *Hindoo's* and *Bramines* preach then every Day to the People, teaching them their Duties, and ordering them to say such and such Prayers; but above all things to be Charitable to the poor and needy.

It is reported, that upon the Hills by *Casmere* there are Men that live some hundreds of Years, and can hold their Breaths, and lie in Trances for several Years together, if they be but kept warm; and that every Year some of them come down unto the People at *Ganges*, and do many great Cures; for whom they have such a Veneration, that they frequently drink the Water they wash their sweaty Feet in. The Penances and Austerities that they undergo are almost incredible; most of them, through their continual Fasting, and lying upon the parching hot Sand in the Heat of the Sun, are so lean dry'd and wither'd, that they look like Skeletons or Shadows, and one can scarce perceive them to breathe, or feel their Pulse beat.

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When any great Man dies amongst them, but especially any of their *Jogees*, or Saints, they make great Preparations for their Funeral; the Corpse is laid on its Belly, and Salt and Rice round about it at every Corner on the Ground. Then the nearest Relations to the Party deceased carry a Pot of Water on their shoulders several times about the Funeral Pile, when they burn them, then breaking it in Pieces, spills the Water. Which Ceremony being ended, the Pile is fired, and then all the Relations begin to howl, and embrace one another, then washing themselves in some neighbouring River, they depart every one to his home; and as for the remaining Ashes, if he be rich they gather them up and cast them into the *Ganges* or the Sea. Sometimes it happens that the Wife of the deceased Party, if she have no Children, and be old, or ill to live in the World, will burn herself with the dead Body; but this happens very seldom. It is said, that in such Cases the *Bramines* give the Woman a stupifying Liquor, which by the time that they are in the Fire makes them senseless of any Pain. To know into what Body the Soul of the deceased is transmigrated they do thus; they strew the Ashes of the dead upon the place where he was first laid after his death, and handfuls of odoriferous Flowers about the same, and returning again in forty four Hours, they judge by some pretended impression or other in the Ashes, into what body it is gone: if the Foot of an Horse, or Dog, or Ox, or such like appear, then they certainly give out that it is gone into such like Creature; but if nothing appear, then they think it is certainly gone to the starry Regions.

As for their Learning and Knowledge it is but little; they have indeed several Books writ in diverse Languages, tho' they contain nothing but a great deal of stuff and cant about their Worship, Rites and Ceremonies. They are ignorant of all parts of the World but their own; they wonder much at us, that will take so much care and pains, and run thro' so many dangers both by Sea and Land, only, as they say, to uphold and nourish Pride and Luxury. For, say they, every Country in the whole world is sufficiently endow'd by Nature with every thing that is necessary for the life of Man, and that therefore it is madness to seek for, or desire, that which is needless and unnecessary.

The last time that I was at *Modufferpore* in *Indostan*, I had a great deal of talk with a *Bramine* somewhat more learned than any of the rest, his name was *Ramnaunt*; he told me a great many Secrets in Physick, and many Traditions and Stories. He says, that if you bury a piece of Money for some considerable time in the mouth of a live Frog, and then dig it up again at midnight, that this piece of Money, to whomsoever you give or pay it, will always return to you again. He says, that if the little Worm in the Wood *Lukerakera* be cut in two, and the one part stirs and the other not, if the stirring part be bruised, and given with half a Beetle to a Man, the other half to a Woman, this Charm will keep them from ever lying absent one from the other. They have Books full of the like absurdities, and caballistick Complication of Figures;



figures; as for example, if you write these following Numbers, 28, 35, 2, 7—6, 3, 32, 31—34, 29, 8, 1—4, 5, 30, 33. in the squares of a square Figure, and your Enemies name under it, and wear it always about you, your Enemy shall never be able to hurt you. So if you write the following Figures in the like manner upon the left hand, 2, 9, 2, 7—6, 3, 6, 5—8, 3, 8, 1—4, 5, 4, 7—with Turmeric, and wash the same off with fair Water of *Ganges*, and drink it, it will cure all manner of venemous Bitings. Multitudes of such like ridiculous fancies they have; all which they seem to have borrowed from the *Cabala* of the *Saracens*, which is full of such like.

I lately heard a *Bramine* say, that if some of the pieces or knots of the Cloaths (in which a Woman hath been burned with her Husband) be saved, and made up in form of a Wick, and fitted for a Lamp, and lighted, and set in a dead Woman's Skull, that it would make the dead party appear. This he said he had done, but I did not believe him. When they have any mad men amongst them, they take them, and put them into a close Room, just big enough to hold them, and almost smoke them to death with Musk and cold Smells, which soon brings their brains into their right temperature, and so recovers them, &c. There happened two things in our Voyage hither which I thought very observable; The first was, that all our Tornadoes brought much Rain with a stink; and if the Seamen did but lay their Cloaths by for twenty four Hours, they became all full of little Maggots. The second is, When we came out of *Europe* we took in some Water at *St. Jago's*, and when we were almost at our Journeys end, our Cooper going with a Candle to open one of the Casks, he had no sooner done it, but the Water immediately took fire, and burnt his Face, Hands and Fingers; but he suddenly turning about quench'd the same, by setting his Breech on it. It stunk pretty much also at the same time, but afterwards came to its native sweetness, &c.

XI. We stay'd at the Island of *Borneo* but two Days, the Season of the Year being so far past, and from thence made the best of our way through the Streights of *Banca* with favourable Winds and Weather, till we came on the Coast of *China* the 13<sup>th</sup> of *August*, then we had variable Winds which carried us abreast of *Emuy* the 19<sup>th</sup> following, at which time the North East Winds setting in fresh, put us in great fears of losing our passage; whereupon we were forced to turn it up against Wind and Current all the way, the Weather so favouring us, that we were never but by our Topsails, else we should have lost more Ground in one Day, than we could have gain'd in eight. The last of *August* we came to an Anchor under the *Crocodile* Islands, both to shelter us from the bad Weather, (which is generally expected on this Coast at new and full Moon, and has been fatal to a great many Ships) and also to look for fresh Water, which was now grown scarce with us, not having re-



cruited since we came from the Cape of *Good Hope*: These are three small Islands lying in the Latitude of twenty six Degrees, about six Leagues from the River of *Hockfieu*; on two whereof we found very good fresh Water, with a convenient watering place on the South West side of the innermost of the three, and by the assistance of a few *Chinese* Fisher-men we procured some fresh Provisions from the main-land, because we did not reckon it safe to adventure our selves thither, lest we should have been brought into trouble by the Government there. While we lay here, on the 5<sup>th</sup> of *September* we had a sudden short shift of the Monsoon to S. W. the fury whereof others felt, in coming upon the Coast of *China* at the same time. The 8<sup>th</sup> of *September* we put to Sea again, turning to Windward Night and Day without all the Islands, which are very numerous along this Coast, to which we were altogether strangers beyond *Emu*, and the Hydrography thereof is hitherto so imperfect, that there was no trusting to our Drafts, which made our Navigation somewhat more dangerous: However, on the first of *October* we got into the Latitude of thirty Degrees, where we came to an Anchor near the Land, until we found the way by Boat to *Chusan*, about twelve Leagues within the Islands; from whence we had a Pilot, who carry'd us safely thither on the 11<sup>th</sup> of *October*. Upon this Island the *Chinese*s have granted us a Settlement and Liberty of Trade, but not to *Ning-po*, which is six or eight Hours sail to the Westward, all the way amongst Islands; this being the largest, is eight or nine Leagues in length from East to West, and four or five Leagues in breadth; about three Leagues from that point of the Main-Land called Cape *Liampo* by the *Portuguese*, but *Khi-tu* by the *Chinese*: At the West-end of this Island is the Harbour, very safe and convenient, where the Ships ride within call of the Factory, which is built close by the Shore on a low plain Valley, with near 200 Houses about it for the benefit of Trade; inhabited by Men, whose Jealousy has not as yet permitted them to let their Wives dwell here; for the Town where they are, is  $\frac{3}{4}$  of a Mile further from the Shore, environ'd with a fine Stone Wall, about three Miles in Circumference, mounted with twenty two square Bastions placed at irregular distances, besides four great Gates, on which are planted a few old Iron Guns, seldom or never used: the Houses within are very meanly built: Here the *Chumpeen* or Governour of the Island lives, and betwixt three and four thousand beggarly Inhabitants, most part Soldiers and Fishermen; for the Trade of this place being newly granted, has not as yet brought any considerable Merchants hither. The Island in general abounds with all sorts of Provisions, such as Cows, Buffalo's, Goats, Deer, Hogs wild and tame, Geese, Ducks and Hens; Rice, Wheat, Calavances, Coleworts, Turnips, Potatoes, Carrots, Beetes and Spinach; But for Merchandize there's none but what comes from *Ning-po*, *Hangcheu*, *Nankin*, and the Inland Towns, some of which I hope to see, when I have acquir'd a little of the *Chinese* Language. Here

also



also the Tea grows in great plenty on the tops of the Hills, but it is not in that esteem with what grows on more mountainous Islands. Altho' this Island is pretty well stor'd with People, yet it's far from what it was in *F. Martinus's* Time, when he describes *Cheuxan*: and this put me in mind, that the superstitious Pilgrimages thereto, mention'd by him, must be meant of the Island *Pouto*, which lies nine Leagues from hence, and three Miles to the Eastward of this Island, whither (they say) the Emperor designs in the Month of *May* next (being his Birth-day, and the fortieth Year of his Age) to come to worship in an ancient Pagod there, famous for Sanctity; having sent one of his *Bonzes* already thither, to get all things in order.

2. I formerly told you, that the Emperor design'd to have come to the Island of *Pou-to* (a place of great Devotion) to worship in the Month of *May* last, being the fortieth Year of his Age, I should have said of his Reign; but all things being prepared there for his reception, he was dissuaded from his purpose by some of his *Mandarins*, who made him believe that the terrible Thunder there was very dangerous. This *Pou-to* is a small Island about five Leagues round at the East end of this Island, famous for the superstitious Pilgrimages made thither for the space of eleven hundred Years: it's inhabited only by *Bonzes*, to the Number of three thousand, all of the Sect call'd *Hofhang*, or unmarried *Bonzes*, who live a *Pythagorean* Life; and there they have built four hundred Pagodes, two whereof are considerable for their Greatness and Finery, being lately covered with green and yellow Tiles brought from the Emperor's Palace at *Nankin*, and inwardly adorn'd with stately Idols finely grav'd and gilded, the chief whereof is the Idol *Quon-em*. To these two great Pagodes belong two chief Priests, who govern all the rest. They have several Ways and Avenues cut through the Island, some whereof are pav'd with Flag-stones, and overshaded with Trees planted on each side: their Dwellings are the best I have yet seen in these parts. All which are maintain'd by charitable Devotions; and the Junks which go from *Ning-po* and this place to *Japan*, touch there both going and coming, to make their Offerings for their good success. There is another Island call'd *Kimptong* five Leagues hence in the way to *Ning-po*, whither, they say, do retire a great many *Mandarins* to live a quiet Life after they have given over their Employments; on that Island also are said to be Silver Mines, but prohibited to be open'd. The rest of the circumjacent Islands are either desert, or meanly inhabited by a few fishing People, but all of them stor'd with abundance of Deer. For it is not long since this Island of *Chusan* began to be peopled; it's true, in *Martini's* Days, about fifty Years ago, it was very populous for the space of three or four Years, at which time the fury of the *Tartarian* Conquest was so great, that they left it desolate, not sparing so much as the Mulberry Trees (for then they made a great deal of raw Silk here) and in this condition it continued till about eighteen Years ago, that the Walls



of the Fort or Town, which now is, were built by the Governour of *Ting-hai*, for a Garrison to expel some Pyrate, who had taken shelter here. About fourteen Years ago, the Island beginning to be peopled, there was a *Chumpeen* or General sent to govern it for three Years, to whom succeeded the late *Chumpeen* (who procur'd the opening of this Port to strangers) whose Government continued till *April* last, being translated to be *Chumpeen* of *Tien-cing Wei* near to *Pekin*, and was succeeded by the present *Chumpeen* who is Son to the old *Chunkoon* of *E-muy*. They have got no Arts or Manufactories here, but making of lacker'd Ware, a particular Account whereof I cannot as yet send you. They begin to plant Mulberry-Trees, to breed up Worms for the production of raw Silk; and they make some Tea, but chiefly for their own use.

The three sorts of Tea commonly carry'd to *England* are all from the same Plant, only the Season of the Year, and the Soil makes the difference. The *Boke*, (or *Voiii*, so call'd of some Mountains in the Province of *Fokien*, where it is chiefly made) is the very first bud gather'd, in the beginning of *March*, and dry'd in the shade. The *Bing* Tea is the second growth in *April*: and *Singlo* the last in *May* and *June*, both dry'd a little in *Tatches* or Pans over the Fire. The Tea Shrub being an ever-green, is in Flower from *October* to *January*, and the Seed is ripe in *September* and *October* following, so that one may gather both Flowers and Seed at the same time; but for one fresh and full Seed, there are a hundred naught; these make up the two sorts of Fruit in *Le Compte's* Description of Tea: as for his other sort, which he calls flymic Pease, they were nothing but the young Buds of the Flowers not yet open. Its Seed-Vessels are really *Tricapular*, each *Capsula* containing one Nut or Seed, and altho' two or one *Capsula* only comes to perfection, yet the Vestiges of the rest may be discerned. It grows in a dry gravelly Soil, on the sides of Hills in several places of this Island, without any cultivation.

\* p. 96.

\* *Le Compte* is mistaken in saying that the *Chineses* are wholly strangers to the Art of Grafting, for I have seen a great many of his paradoxical Tallow-Trees ingrafted here, besides some other Trees. When they ingraft, they do not slit the Stock as we do, but cut a small slice off the outside of the Stock, to which they apply the Graft (being cut sloping on one side, agreeable to the Slice cut from the Stock) bringing up the Bark of the Slice upon the outside of the Graft, they tie all together, covering with Straw and Mud as we do. The *Chinese* Che or Cubit is of two sorts, one of thirteen  $\frac{7}{8}$  *English* Inches, which the Merchants commonly use: the other is of eleven Inches, us'd by Carpenters, and also in Geographical Measures.

Having made enquiry about *Martini's* Account of sowing their Fields at *Ven-cheu* with Oyster-shells, to make new ones grow; I was told that after they have taken out the Oysters, they sprinkle the Shells with Urine, then putting them into the Water again, there grow new Oysters



on the afore said Shells. The *Fula Mogorin* of the *Portuguese*, I'm sure is the same with the *Syringa Arabica flore pleno albo* Parkinson. All the *Kicu-yeu* or Tallow-Trees that I have seen here bear a spike of small yellow Flowers like the *julus* of a *Salix*. The Bean, or *Mandarin* Broth, so frequently mention'd in the *Dutch-Embassy* and other Authors, is only an Emulsion made of the Seed of *Sesamum* and hot Water.

Their chief Employments here are Fishing and Agriculture. In Fishing, they use several sorts of Nets and Lines as we do; but because they have large Banks of Mud in some places, the Fisherman, to go more easily thereon, has contriv'd a small Frame about three or four Foot long, not much larger than a Hen-trough, elevated a little at each end, in which he rests upon one Knee, leaning his Arms on a cross Stick, rais'd so high as his Breast, and putting out the other Foot often upon the Mud, he pushes forward his Frame thereon, and so carries himself along in it.

As to their Agriculture, all their Fields (where any thing is planted) whether high or low, are made into such Plots as may retain the Water on them when they please. They plow up their Ground with one Buffalo or one Cow. Where they are to sow Rice, they prepare the Fields very well, by clearing it of all manner of Weeds, moistning to a pulp, and smoothing it with a Frame drawn across; on which they sow the Rice very thick, and cover it only with Water for two or three Inches high, and when it has grown six or eight Inches long, they pull it up by the Roots, and transplant it (by Tufts in a streight Line) to Fields overflown with Water; and where a Field is subject to Weeds, when the Water dries up, they prevent their Growth in overturning the Mud with their Hands in the Interstices where the Rice is planted. When they sow Wheat, Barley, Pulse, and other Grains, they grub up some superficial Earth, Grass and Roots, and with some Straw they burn all together; this Earth being sifted fine, they mix with the Seed, which they sow in Holes made in a streight Line, and so it grows up in Tufts as the Rice does; the Field being divided into Beds and harrowed over, both before and after the Seed is sown: This makes them somewhat resemble Gardens. Altho' they meliorate their Fields where they sow Rice, only by letting the Water on them, yet for other Grains, where ground requires it, they make use of Dung, human Excrements, Ashes, &c. In watering their Fields here they use the same Instrument mention'd by *Martini* in the Preface to his Atlas, being all of Wood, and the contrivance the same with that of a Chain-Pump.

Their method in making of Salt is this: All the Shores here being Mud, instead of Sand, in the Summer Season they pare off the superficial Earth, which has been overflown with the Salt Water, and lay it up in heaps for use; when they are to use it they dry it in the Sun, rubbing it small; then digging a Pit, they cover the bottom thereof with



with Straw, at which through the side of the Pit they pass a hollow Cane, that leads into a Jar, which stands below the Level of the Pits bottom; they fill the Pit almost full with the aforesaid Earth, and pour Salt Water thereon till it be covered two or three Inches with Water, which drains through, into the aforesaid Jar, and is afterwards boil'd into Salt.

I have seen a singular Root since I came here call'd *Hu-chu-u* (which I take to be the same) whereto they ascribe wonderful Properties of prolonging Life, and turning grey Hairs into black, by drinking its Infusion for some time, insomuch that they say 'tis to be had in value from ten Tael to one or two thousand a single Root; for the larger it is, the more is its Value and Efficacy; which is too much Money here to try the Experiment.

Observations  
on Ceilan, by  
Mr. Strachan.  
n.287 p.1094.

XI. The way they catch Water-Fowls is this. In Loughs and Waters which are not very deep, the Fowler puts an earthen Pot upon his Head, in which Pot are bored holes, through which he may see; then he wadeth in the Water, nothing being seen but the Pot which covereth his Head, and thus enters in the midst of all the Fowls, they thinking it to be a Block or the like driving do not take notice of it, although it be upon their side; then he takes hold of one by his Foot, and draws him under Water, and wrings his Neck about; the rest of the Fowls, not perceiving this, sit still, then he goes to the next Fowl and does the same; and so going forth he catches as many as he pleases. Those that have Guns, make a Frame, which they cover with green Branches, which are so broad as to cover their whole Body. They stand behind it; then carrying the Frame before him, the Bird or Deer seeing nothing but the green Branches is not affrighted, and thus the Hunter being advanced near enough, gives fire.

It is wonderful to consider, how some Beasts are affrighted by Fire, as Lions, Tigers, Wild Swine, and other Beasts; and as the *Ceilanefes* chase the Elephants, Wild Swine and Tigers from their Plantations by Fire, and the Natives at the *Cape of Good Hope* chase the Lions from their Cattel; so also do the *Ceilanefes* catch Harts, Deers, Elks, and Hares, which they perform in this manner. In time of the Night two Men go into the Wood, one of these takes an earthen Vessel upon his Head, wherein is Fire burning, made of Sticks and a kind of Refine, and in one Hand he carries a Staff, whereon are fastned eight Bells, which the more harmonious they are, so much the better, the other Man goes behind with a Spear in his Hand; whenever the Deer perceiveth the Light and hears the Bells, he draws near to it, standing and beholding it as amazed, for he sees not the Men; in the mean time the Man with the Spear pierceth his Body, and catches him. Now Elephants, Tygers, Serpents and Wild Swine run when they see the Fire, so that the Hunters need not fear them.

There



There are two sorts of Serpents that Capt. *Knox* does not mention, which are thought not to be venemous, and a *Ceilanese* will not kill; the first is of a bluish Colour, and comes frequently into Houses, and searches for Rats only, and eats them; he creeps into their Nests, and makes a Destruction among them; he is of the Thickness of an Inch and a half Diameter, and about two Yards and a half long. The other is green like a Leaf of a Tree, who winds himself, and climbs upon the Trees, and catches the Birds, lying still all the time as if he had no Motion, until he sees a fit Opportunity to catch. He is about one half Inch Diameter, and a Yard long.

The *Talgoi* will lie as if he were dead beside these little Nests which are built by these Ants called *Waia*, letting his Tongue stick out as far as he can; these Ants will immediately fix themselves in great Numbers round about and upon his Tongue, to carry away the Slime which is upon the Tongue, thus he draws in his Tongue and swallows them, and then he shoots forth his Tongue again, and continues so to do until he has satisfied his Hunger.

If a Man be lying or sleeping, an Elephant will not mind him. A Company of *Dutch* Soldiers marching from *Columbo* to *Gurbewil*, one of them did stay behind to rest himself, and did slumber upon the way-side. An Elephant coming out of the Woods, went within two Paces of him, but when he was passed by about seven or eight Paces, the Souldier did awake and see the Elephant, and not thinking it safe to run, because the Elephant did not mind him, lay still until he perceived the Elephant to be gone.

There are two sorts of Cinnamon-Trees, of which the Tree which is esteemed the best has a Leaf much larger and thicker than the other, but otherwise no Difference is perceived. If these Leaves, as well one sort as the other, be distilled, they yield an Oyl and Water, as if Cloves had been in the Still. Upon the Root of this Tree is a thick Bark, which, when it is distilled, as the former, yields Oyl and Camphire also; which is separated by covering the Receiver with a Linen Cloath, and the Camphire will remain in the Cloth in a Lump together, and the Oyl and Water will run into the Receiver. This Camphire has the same Colour, the same discussing, dissolving and healing Balsamick Quality of the Camphire of *Japan*; the Oyl is of the same Virtue; anointed upon Scabs, Itch and Excoriations, it cures them in a short time. To drink the Water among common Waters cures Fluxes, and does good to those who are under that languishing Disease, called by the *Hollanders* the *Lands Disease*, and by the *Ceilanese*, *Pipa*; of which we shall make mention at large in its proper Place. I never did see the Natives make use of Cinnamon, although they have scarcely a Meal without Pepper: neither is it used by the *Europeans* either in Meat, or distilled among the Rack, or infused in Drink, for it is thought that it occasions Shortness of Breath.

There



v. 282. p. 1248.

There is a great Quantity of a kind of white Coral upon the Shore betwixt *Gale* and *Mature*, and many other Coasts in the *Indies*, of which the *Hollanders* cause Lime to be burnt for building of Houses, and the Walls of the Fortifications. There are great Banks of the said Coral, it is porous, neither so firm and smooth as the upright, which grows in little Branches, and when they are come to the full growth, there grows other betwixt these, and then upon these grow others, until it is become like a Rock for thickness; these Branches are not softer when they are young, than when they are ripe, yet I have observed a Slime upon them always when they are under Water, which I suppose is the Substance which petrifies. I have seen three Leagues from *Batavia* upon that Island, where the *Hollanders* turn up the Keel of the Ships to dress and mend them, Oysters of a Foot Diameter, the Shell of one of these did grow until it was three Foot of Diameter broad, and a Foot thick, after the Flesh was petrified; upon these Shells, lying only three or four Foot under Water, I also always did find a Slime. Upon the Coast betwixt *Gale* and *Gindere* lies always *Os Sepiæ*, and in the River at *Catoene* there are found Rubies, and if one is desirous, and seek among the Sand in the Water, he will find above a Drop weight of Rubies in the space of one Hour, but they are very small, for twenty of them will scarcely weigh a Grain weight, so that it is not worth a Mans while. Upon the Sea-Coast upon the Sand do lie a kind of little Cockles of the Bigness of Crabs Eyes or *Oculi Cancrorum*, there is no Cavity within, if beat into Powder they have the same Effect as *Testaceous* Powders, and are used instead of *Oculi Cancrorum*.

There are several Trees, one of which will be above six Fathom high, whose Root (I may say), grows above ground, after the following manner: when the Twig is about one half Foot high above ground, there grows out of the middle of the Stem a little Knot which grows downward, making an Angle with the Stem of thirty Degrees or thereabout until it touch the Ground, then it fixes in the Ground, sending forth small Sprigs, which, before it touched the Ground, had neither Branch nor Leaves, but all over green even like a Shoot. While this Shoot grows and the Stem grows higher, it still shoots forth other Shoots, which always come out of the middle of the Tree or Trunk; thus it continues shooting forth these Shoots, until the Tree be at his full Growth, and the higher the Trees grow, the Knots and the Shoots are the thicker and longer, so that one of the Shoots which grows last, will be a Foot thick of Diameter, and three Fathom long. Now the Flower which is called *Happumal* grows upon a Tree that grows after this manner, and grows only two Fathom high; if they be planted round about an Orchard they are an excellent Hedge, for the Leaves are thorny and full of Pricks; when the Flower decays it carries a Fruit like a Pine-Apple, but is for no use.

*Sakradewendra* commands and governs all the rest of the Gods, and did hear formerly the Prayers that were offered up to him from distressed People



ple here upon Earth, and did grant their Request, but now the Golden Chair whereupon he used to sit is gone, and the Prayers which are offered up to him now have no Effect, because the Foot of that Chair was made of a kind of Wax, which would turn soft by the Prayers and Tears of the Supplicators, and would sink downward, by which means the *Sakradewendra* would look down and take notice of the Prayer of the Supplicant and grant his Request. This Chair being of fine Gold was distributed among the Poor, which is the Cause wherefore he does not now perceive or know when any Man makes Supplication to him, therefore there are but few People that have any Benefit of the Prayers and Tears which they offer to him. He can indeed look far when he turns his Eyes towards any Place, for his Forehead resembles the Peacock's Tail, it is so full of Eyes, and so sometimes it chances that he looks down and takes notice of Men, but this is but seldom; therefore there is a Necessity for one to pacify these wicked Spirits which trouble us here on Earth. I could never understand of them how long this *Dewendra* had been a God, or how long he would reign, for none trouble their Heads to regard him any more.

The *Budun* whereof the *Banapots* (or their Bibles, if I may call them so) makes great mention, has had the Life of all the Species of living Creatures that are in the World, having been first an Insect, after his Death his Soul was regenerated into a Mouse, after that an Ox, then a Monkey, and so forth, then a Man: and by his good Life and Merits was still born in a better Condition, until he is become the supreme of all the Gods. Of the *Buduns* there have been three, every one of these Reigns has been counted after this manner, there is a great Hill about half a Mile of perpendicular Height, and about six Miles in Circumference, from the Hill a certain Bird comes once in a thousand Years, and takes one Grain to a certain Place, and continues every thousand Years once, until he has removed that Hill to another Place.

XII. The *Cape of Good Hope*, which is Part of *Monomotapa*, and the Southernmost Part of *Africa*, lies in the Latitude of thirty four Degrees thirty Minutes South, and sixteen Degrees fifteen Minutes East of *London*. It was first, that we know of, discovered by *Bartholomew Diaz*, *A.D.* 1493, under *John II.* King of *Portugal*. He gave it the Name of the *Cape of Tempests*, because of the Storms he met with there, with which 'tis not strange that it is sometimes troubled; as likewise with a Sea that runs very high, and makes it ill riding at Anchor there when the Wind is at North-West, seeing it is a Shread of Land stretch'd out into a vast Ocean on each side; but King *John* gave it the Name of *Bona Esperança*, or of *Good Hope*, which it still retains; because that when that Cape was doubled, he had good Hopes of finding out a Way by Sea to the *East-Indies*, about which he was then very solicitous.

*Of the Cape of Good Hope, by Mr. Maxwell, n.310.p.2423.*



The *Hottentots*, Natives of this Place, are a Race of Men distinct both from *Negroes* and *European Whites*, for their Hair is woolly, short and frizled, their Noses flat, and their Lips thick, but their Skin is naturally as white as ours, as appear'd by a *Hottentot* Child brought up by the *Dutch* in their Fort here. Their Stature is universally of a middle Size; they are clean limb'd, well proportion'd, and very nimble. I never saw a fat Person among them. They besmear their Faces and Bodies all over with Suet, or other oleaginous Stuff, which, together with exposing their Bodies to a warm Sun, makes their Skin of a Tawny Colour, and causes them to stink so, that one may smell them at a considerable Distance to the Windward; they adorn their Hair, which is always clotted with Grease and Nastiness like the Thrums of a Mop, with Shells, Pieces of Copper, &c. Both Sexes are clad with the Skin commonly of a Sheep, but sometimes of such wild Beasts as they happen to kill, the hairy side outward in Summer, and inward in Winter, off which I have seen them pick and eat the Lice in the Streets: The Women wear Skins cut in Thongs about their Legs, to the Length of a great many Yards; which when dry, with the inside out, look so like Sheeps Guts, that most Strangers mistake them for such. The Men hang their Privities in a Bag, and the Women cover theirs with a Flap or Apron made of Skin. The Women wear a Cap of Skin just dried and stitch'd together, whereas the Men commonly go bareheaded; they go bare-footed, except that when they travel they wear a Piece of a Skin fasten'd about their Feet. Their Weapons are Javelins, with which they are dextrous at hitting the Mark, and Bows with poyson'd Arrows, which kill, as I am inform'd, upon drawing Blood, but what they are envenom'd with I could not learn: their Houses are Hemispherical, made of Mats, supported with Stakes, so low that a tall Man cannot stand upright in one of them; These they remove upon Occasion, as the ancient *Nomades* did their Tents.

By all that I have seen and heard of them and other Nations, they are the most lazy and ignorant Part of Mankind; by virtue of which two most excellent Qualifications, there are no manner of Arts practis'd among them, no Plowing or Sowing, no going to Sea in so much as a Boat, no use of Iron or Money, no Notion of God, Providence, or of a future State, no Tradition of Creation, or a Flood, no Prayers or Sacrifices, no Magical Rites; nor, in fine, any Notion of an Invisible Being capable of doing them either good or harm, upon the strictest Enquiry that I could make of Men of Sense that had liv'd some time upon the Place; so that I believe their Ignorance hardly can be parallel'd: The only thing that looks like the least Knowledge of any thing of this kind among them (in as much as I could learn) is a Custom they have in Moonshiny Nights of Dancing in the Fields, of which, if you ask them the reason, all their Answer is, that it is a Custom of the *Hottentots*, and was so of their Forefathers; and that is all they can tell of the Matter. Now whether it be that they rejoyce in its Light, which dispels that Darkness of which they

are



are then most sensible, or whether they think it a Rational Being endued with freedom of Will, because of its various Change of Forms, or for what other reason I will not pretend to determine; however as to no other thing, so neither to this do they pray or sacrifice: Nevertheless some Voyagers have upon this ground, how truly I will not say, confidently writ, that they worship'd the Moon; and upon Enquiry I could not find that they took so much, nor indeed any such notice of the Sun or Stars; which former at least one would think a People so grossly ignorant would pay some respect to, if they worship'd any God, that being the most glorious Object of their Senses: and accordingly we find it affected all Heathen Nations, as well the more Barbarous as the most Polite; in which single Object, if we may believe *Macrobius*, all their Worshiping center'd. Their great Ignorance, I suppose, may be in part caus'd by *Africa's* being peopled (as is probable) by that End of it which joins to *Asia*; so that the more the Inhabitants spread themselves toward the Southern Extream, the more they were cut off from conversing with the more civiliz'd Part of the World; it is probable, I think, that they were propagated to this Place by the Eastern Coast of *Africa*, the Western being now, and always having been, as far as we know, inhabited by *Negroes*, from whom it is not very probable, that these of so different a Colour should have sprung.

All the Resemblance they have of Government is, that in every Neighbourhood the Eldest is first in Order and Dignity; his Advice as to what concerns the whole being most follow'd, as having most Experience. The Ceremony of Marriage is perform'd among them by the eldest Person in the Companies, sprinkling the Persons to be Married with his Urine, upon which, and cutting out one of the Man's Testicles, the Business is over; this several that lived in the Place affirm'd to me for a certain Truth. Being inquisitive to know the Truth of this, I had the Curiosity to search several of them, (who will readily suffer you for a double Stiver to do it) in two of which I could find but one Testicle, they (I suppose) being Marry'd, as the rest who had two were not; which however shews the Mistake of *Nieuhoff* and others, who assert, That the *Hottentots* cut out one of the Testicles of all their Male-Children as soon as they are born (according to *Nieuhoff*,) or at the Age of nine or ten Years (according to others) and that, forsooth, to make them the more swift and nimble. When a Woman bears Twins among them, she exposes one to Death by Hunger or Cold, and nurses the other; the reason of which two last Customs is alledg'd by some, how truly I know not, to be the Fear they have of their Nation's growing too numerous: The Custom of revenging, rather than punishing Adultery with Death, has prevail'd among them. I was inform'd there, that they abhorr'd *Polygamy*, tho' some Writers have asserted the contrary, but (perhaps) they are as well mistaken in that, as in the Semicastration of their Males. When any Person grows decrepid with Age, their Children, or nearest Relations, shut them



up in their Houses, and starve 'em to Death: They bury their Dead with the Skins they wore when alive about them. Their Food is for the most part Roots; but chiefly one by the *Dutch* call'd *Ontee*, which is roundish, about the bigness of ones little Finger, and hot in the Mouth; their Drink is Milk and Water; when they kill a Sheep, or a Cow, they eat the Guts and Garbidge, either broil'd or quite raw; they are great Lovers of *Tobacco* and *Brandy*, to purchase which from the *Dutch*, is all the use they have of Money. They are not *Cannibals*.

There was a *Hottentot*, who had liv'd for some considerable time in *Holland* and the *East-Indies*, and had learned to speak *Dutch* and *Portuguese* very well, whom, upon his return home, his Wife, Children, and Friends, could not endure, nor would they converse with him, till upon resuming his ancient Habit, Diet, and Customs, he had returned to their way of living. Notwithstanding their great Ignorance, they distinguish several of the more remarkable Stars by Names of their own imposing: Nevertheless they have no distinction of Weeks, of Months, or of Years, any otherwise than by their *Rainy Seasons* (of which afterward;) for if you ask a *Hottentot* how old he is, he answers, so many *Rains*. They watch the *Elephants* where they use to Water, whom they shoot in the Eye, where only they can wound 'em.

This Country produces Lyons, Tygers, Elephants, Rhinocerot, Elks, (whose Hoofs here are said not to have that Virtue ascrib'd to 'em in Northern Climates,) Leopards, Wild Asses, of which one sort is finely streak'd with White and dark Brown; several sorts of beautiful Wild Goats, Jackals, Baboons, Monkies, Deer, large Cows, and large Sheep without *Horns*, with *Hair* like a Goat, instead of *Wool*, and with large *Tails*, but not (in as much as I have seen) so large as some report 'em, viz. of twenty five Pound weight, (the Flesh however of both which is very good;) small Horses, &c. Ostriches, Pellicans, Hawks, Magpies, Wild Peacocks, Cranes, Guiney Hens, Pengwins, Flamingo's, Rock-Ducks, Partridges, Pheasants, Geese, common Hens, Turkeys, and Ducks, &c. Here are likewise Manatees or Sea Cows, they are low, very thick and ill shap'd, have very short Feet, and yet are very swift, have no Hair but what grows about their Nostrils, have large Teeth, but are no Enemy to Man; they are not easily wounded, live much in Rivers, and are very shy. Here are Serpents of various kinds, with which however they are not much infested. Their Soil produces most sorts of Fruits and Plants that grow with us, as Grapes of several kinds, Apples, Quinces, Olives, Oranges, Apricots, Cherries, Aloes of a great many kinds, but none (that I saw) of the right sort, such as *Socotra* produces, Pompions in abundance, Cabbages, &c. Corn, as Wheat, Barley, &c. of *Dutch* Cultivation. Here are likewise Lizards, Salamanders and Porcupines. This place is fit to produce whatsoever is planted in it, the Soil and Climate conspiring to its Advantage.



The *Dutch East India* Company are said to have bought this Place of the Natives; if they did, they certainly had a good Bargain of it for a little Tobacco and Brandy: But the *Dutch*, who are no better than their Neighbours, are not so very scrupulous as to trouble themselves much about buying, in such cases, what they can take by force. Here however they have settled for the Convenience of a Rendezvous for their homeward bound *East India* Fleet; and they have possessed themselves of the Country sixty Miles from the Place of their first Settlement: Beside their principal Town in *Table Valley* (so call'd from a neighbouring Hill, call'd *The Table Land*, because of its Figure, from whence also the adjoining Bay is call'd *Table Bay*) where they have a Fort, an Hospital, a supplied Church with about three hundred Families; they have two other small Towns in the Country, call'd *Draegenstein* and *Stallambuss*, inhabited for the most part by *French Protestants*, who make most of the Wine the Place produces, which is not inconsiderable, either for Quantity, Quality or Variety, resembling *French Claret*, *Rhenish*, *Burgundy*, &c. they are about one hundred and twenty Families, and have one Minister between both Villages, a *Dutchman* who speaks *French*.

In this place are reckon'd about two thousand Persons fit to bear Arms, and about six hundred Soldiers; no Person that is not in their own Service, tho' a *Dutchman*, is admitted into their Fort. They have prohibited the *English* to set up among them, tho' they have served the usual time of five Years in their Service, which Liberty they deny not to those of any other Nation; and this, I am inform'd, is their practice in all their *East India* Settlements: However when any *English* Ship happens to touch here disabled in Masts, Rigging, Anchors, &c. they supply 'em for their Money out of their Stores. Instead of Customs and Excise, they use Monopolies; for the Monopolies of Wine of the Growth of the Place this Year 1706, was paid 39000 Guilders, imported Brandy 3000, and so of the rest. All the publick Payments they make, are either for the Watch, or for killing of Lyons, twenty Dollars Reward being given for killing a Lyon, and ten for a Tyger; the latter they Hunt, but the former they only dare attempt by Stratagem, whom they thus destroy: When a Lyon in the Night time gets among their Cattle, he commonly kills more than he eats at that time, whither he seldom fails to return the next Night to eat up the rest; but before he comes, they take care to set Snares about the Prey with Musquets so dispos'd, that in coming at it, he must of necessity draw the Trickers, the Muzzles being so planted, as that they seldom miss him; but if he be not kill'd out right, the poor Musquets are sure to feel his Fury, for he gnaws the Stocks, and imprints the marks of his Teeth in the very Iron; and tho' they are able to go away, there they are known to watch for two or three Days to see who comes to look after the Execution, whom they set upon if be not well aware.



A sort of Pilgrims in the *East Indies*, whom they call *Fouquiers*, and who often have occasion to travel thro' the Deserts, have a strange dexterity in killing these Wild Beasts; for when he sees one of them making towards them, he faces him, kneeling on one Knee, and holds towards him a short Spear in his left Hand, upon which, the Beast making a Leap at him pitches and fixes his Body, and then he runs down his Throat a Ponyard which he carries in his Walking-Staff, and so kills him. The *Colchester*, an *English East India* Man, was at that time in *Rogues River* in *Bengal*; it was Night when several of the Ships Company happen'd to be ashoar in a Tent they had pitch'd to be merry in. Mr. *Ravenscraft* the Second-Mate had just put on a clean Shirt, he happen'd to be the farthest in the Company from the Door, with his Face opposite to it, when a Tyger rushed in among them, seiz'd and carried him off in spight of them without having so much as a squeak for his Life: I suppose the glaring of the White Shirt, affecting the Tyger the most sensibly of the Objects that were before him, made him fix upon him rather than the rest; the next Day, upon search, they found some Remnants of his Body in an adjacent Wood. When a Tyger leaps at a Man, if his first Aim be avoided, he never, as they say, makes a second Attempt.

The Winds which blow at the *Cape of Good-Hope*, are of that kind which are call'd *Monsoons*; for between the beginnings of *March* and *September*, (which is their Winter) the Wind blows for the most part between the North and the West, during which time they have not much fair Weather, from which rainy Season the *Hottentots* compute their Year; but during the other half Year, the Wind generally blows between the South and the East, accompanied with very fair Weather: There oftentimes come down from the Neighbouring Hills most sudden and violent Gusts of Winds upon the Neighbouring Parts.

The Companies Garden, which is about nine hundred and seventy of my Paces long, and two hundred and thirty broad, is not now in that fine order it was in during this Governour's Father's Time, when it was divided into four parts, in each grew abundance of the more remarkable Vegetables belonging to its corresponding Quarter of the World; but tho' the Climate, Soil and Situation are very favourable, 'tis now much neglected both in respect of its Plants and Walks, neither of which are extraordinary.

I met here with one *Teunis Gerbrantzen*, Master of a *Dutch* Ship, who in the Year 1690, was at *Terra di Natal* on the Eastern Coast of *Africa*, in the Latitude of thirty Degrees South, distant from the *Cape of Good Hope* about eight hundred Miles, where he said he bought the Place for the *Dutch East India Company*, for twenty thousand Florins. Coasting thence to the *Cape of Good Hope*, his Ship was cast away, but they all got safe ashoar, who, to the Number of eighteen, set out by Land



Land for the Cape distant about two hundred Miles, where only four of them arriv'd, all the rest dying by the way, through extremity of Hunger, Thirst or Heat, except two or three that were kill'd by the *Hottentots*; they met with no Wild Beasts by the way, Elephants excepted, whom they saw in great Numbers. In Year 1705, *Gerbrantzen* went again to *Terra di Natal*, the late King's Son then reigning, to whom he spake of the former Agreement with his Father: *My Father*, answers he, *is dead, his Skins (i. e. Cloaths) are buried with him in the Floor of his House, which is burn'd over him, and the place is fenced in, over which none must pass; and as to what he agreed to, it was for himself, I have nothing to say to it.* So *Gerbrantzen* urg'd it no farther, having no Orders concerning it from the Company. At his last being there, he met with an *English* Man who was left there, *A. D.* 1698; he had two *Hottentot* Wives, and Children by 'em, but would not return with him to *Europe*, lest his Wives and Children should be slain in his Absence.

*Mr. Kolbe*, who was sent thither by a *Prussian* Lord, the Baron *Krosick* told me, the common Salt there made use of by the *Dutch*, was left in hollow places of the Earth's Surface, after the Sun had evaporated the Rain Water; the matter of Fact seems to me hardly credible; but if it be so, I think it can proceed from no other Cause, but the Rains dissolving a Salt contain'd in the Earth, which upon the Rains being evaporated, remains in the bottom; which is the more probable, because that within five Leagues of the Fort is the Salt Bay, which has its Name from the vast Quantity of Salt digg'd near it.

XIII. 1. In visiting our religious Houses, I travelled over the Country of the *Pintados*; which are large Islands separated from one another by Arms of the Sea, whose Ebbing and Flowing renders their Navigation very difficult and dangerous. At the Town of *Guivam* in the Isle of *Samal*, the last and most Southern Island of the Eastern *Pintados*, we found twenty nine *Palaos*, or Inhabitants of certain new-discover'd Islands. The Easterly Winds, that blow on these Seas from *December* to *May*, had driven them three hundred Leagues from their own Islands, to this Town of the Isle of *Samal*, where they arriv'd in two small Vessels, call'd *Paraos*.

*Of the Discovery of the New Philippine Islands. n. 317. p. 189. A Letter from Manila, by Father Clain.*

They embarked, to the Number of thirty five Persons, to pass over to one of the Neighbouring Islands; when there arose a very strong Wind, that forced them out into the main Sea, so that they could not gain the Island they design'd for, nor any of the neighbouring ones. After having made several Attempts to get ashore on some Island within their knowledge, but in vain, they were driven before the Wind for seventy Days together, without being able to make any Land. At last, out of all hopes of returning to their own Country, and half dead for want of Water and Provisions, they resolved to give themselves up to



to the Mercy of the Winds, and land at the first Island westerly that they should come to. They had no sooner taken this Resolution, but they found themselves in sight of the Town of *Guivam* in the Isle of *Samal*. A *Guivamois* that was then on Shoar, perceiving them, and judging by the Make and Smallness of their Vessels, that they were Strangers, and out of their Way, took a Piece of Cloath, and made them a Signal of entering the Road he directed, to avoid the Shoals and Banks of Sand, they would otherwise run upon. These poor People were so frightened at the Sight of this Stranger, that they began to put out again to Sea; but notwithstanding all their Endeavours, the Wind forced them back a second time towards the Shoar. When they were near, the *Guivams* again made the Signal as before; but seeing they did not mind it, but would unavoidably be lost, he threw himself into the Sea, and swam to one of their little Vessels, on purpose to bring them safe into Shoar. He was no sooner got to them, but the Women with their Children at their Backs, and all that were in the Vessel, threw themselves over-board and swam to the other: He, seeing himself alone in the Vessel, resolved to follow them, and getting aboard the second, shew'd them how to avoid the Shoals, and brought them safe to Land. In the mean time they stood immovable, and resign'd themselves up intirely to the Conduct of this Stranger, as so many Prisoners.

They landed on *St. Innocent's Day*, the 28<sup>th</sup> of *December* 1696. The Inhabitants of *Guivam*, running to the Shoar, received them very kindly, and brought them Wine and other Refreshments. They eat *Coco's* very freely, which are the Fruit of the Palm-Trees of this Country: The Pulp of them is somewhat like that of Chesnuts, except that it is more oily, and furnishes them with a sort of sweet Water, very pleasant to drink. They gave them Rice boiled in Water, which is eat here and all over *Asia*, as Bread is in *Europe*. They looked on it with Surprise; and taking some Grains of it, threw it on the Ground, imagining it to be Worms. They rejoyce if one brings them great Roots, call'd *Palavan*, which they eat greedily. In the mean time they brought to them two Women, that had formerly been driven on Shoar on the Coast of *Guivam*; who knowing a little the Language of this Country, it was by their means they learnt what I shall hereafter relate. One of these Women found among those Strangers, one of her Relations, who as soon as they knew one another, fell a weeping. The Father, who has on him the Care of this Town, having heard of the Arrival of these People, sent for them to *Guivam*. As soon as they saw him, and what Respect was paid him, imagining that he was the King of the Country, and that their Lives were in his Hands, they threw themselves on the Ground, to ask his Pardon, and beg their Lives. The Father moved with Pity to see them so disconsolate, did all he could to comfort them; he caressed their Children, three of which still suck'd, and five others were somewhat older; and promised their Parents to give them all the Assistance in his Power.

The



The Inhabitants of *Guivam* strove one with another, who should entertain these Strangers at their Houses, and furnish them with Provisions and Clothes, and whatsoever else should be necessary ; which the Father granted them, on Condition they did not separate those that were Married, or take less than two of them together, for fear any should die of Grief if left alone. Of thirty five Persons that embarked, five died through want of Provisions and other Hardships in so long a Voyage ; and some time after their Arrival here, died another.

They relate that their Country consists of two and thirty Islands ; which cannot be far distant from the *Marianas*, as may be judged by the Make and Smallness of their Vessels, and Form of their Sails, which are very like those of the *Marianas*. It is likely these Islands may be eleven or twelve Degrees of Northern Latitude, more Southern than the *Marianas*, and under the same Degree of Longitude as *Guivam* ; for sailing directly from East to West, they came ashore at this Town. It is also probable, that it was one of these Islands that was discover'd some Years ago at a Distance, when a Ship belonging to the *Philippines*, leaving the common Road, which is from East to West under the third Degree of Longitude, and running further to the South-East, first perceived it. Some call this Island *Carolina*, from *Charles II.* King of *Spain* ; and others the Island of *St. Barnaby*, because discovered on the Day that the Church celebrates the Feast of that Apostle. It was again seen last Year, by another Vessel that a Storm had driven out of its Road, in going from hence to the *Marianas*. The Governor of the *Philippines* has often given Orders to a Vessel, that goes almost yearly to the *Marianas*, to look for this and other Islands that they suspected to be hereabouts ; but these Orders were ineffectual, God preserving to this time the Discovery of them, and (as we hope also) the intire Conversion of these People. Of these two and thirty Islands, there are three of them that are uninhabited, unless it be with Wild Fowls ; but the others are very well peopled. If any one ask the Number of Inhabitants, they point to a Heap of Sand, to shew that their Number is infinite. The Names of these Islands are *Pais*, *Lamululutup*, *Saraon*, *Yaropie*, *Valayyay*, *Satavan*, *Cutac*, *Yfalcu*, *Piraulop*, *Ytai*, *Pic*, *Piga*, *Lamurrec*, *Puc*, *Falait*, *Caravaruvong*, *Ylatu*, *Lamuliur*, *Tavas*, *Saypen*, *Tacaulap*, *Rapiyang*, *Tavon*, *Mutacusan*, *Piyla*, *Olatan*, *Palu*, *Cucumyat*, *Piyalacung*. The three that have nothing on them but Wild Fowls, are *Piculat*, *Hulatan*, *Tagian*. *Lamurrec* is the most considerable of all these Islands : It is there that the King of the Country keeps his Court ; the Governors of all the other Islands are subject to him. Among these Strangers there is one of these Governors, and his Wife, who is the King's Daughter. Though they go half naked, yet their Carriage, and a peculiar Air of Greatness, sufficiently distinguishes them from the rest. The Husband has his Body painted all over with certain Lines, in such manner that they form several Figures : The rest of the Men are also painted in like manner, more or less. The Women and Children are not painted at all. There



are nineteen Men of them, and ten Women, of different Ages. The Make and Colour of their Face is much like that of the *Philippinois*. The Men have no other Clothes, than a sort of Sash, several times wrapt about their Body, that covers their Reins and Thighs. They wear upon their Shoulders above an Ell and half of coarse Linen Cloth, like a Cowl, tied before, and hanging loose behind. Both Men and Women are dressed much alike, except that the Women have a piece of Cloth somewhat longer, that hangs from their Waste down to their Knees.

Their Language is different from that of the *Philippines* and *Marianas*: Their manner of pronouncing it comes nearest that of the *Arabs*, as some who understand that Language have observed. The Woman, that seems the most considerable among them, has several Rings and Necklaces of Tortoise-shell, (call'd here *Carey*) and others made of a Substance yet unknown to us, much resembling Ambergrise, but not transparent. The manner of their living at Sea, which was for seventy Days together, continually driven by the Wind, was thus: They cast out a sort of Net, made of a great Number of little Twigs of Trees tied together, having a large Mouth for the Fish to enter in at, and ending in a Point to prevent their getting out again. The Fish they took after this manner was all the Nourishment they had, and Rain-water saved in Coco-shells, which is the Fruit of the Palm-tree (as observed before) of the Figure and Size of a Human Scull. They have no Cows in their Islands: As soon as they saw them, they ran away, as they did likewise at the Barking of a Dog, in one of the Missionaries Houses. Neither have they Cats, Stags, Horses, or in general any Quadruped. Nor any Fowls but Sea-Fowls; excepting Hens, which they breed up, but never eat their Eggs. Notwithstanding this their want of every thing, they are very merry and contented with their Condition. Their Songs and Dances are exact and regular: When they sing, it is all together, every one observing the same Humour and Gestures, which makes it very agreeable. They are surprized at the Government, Politeness, and Manners of the *Europeans*, of whom they had not the least Knowledge. They admire not only the Solemnities and Ceremonies of the Church in celebrating Divine Service, but also the Musick, Instruments, Dances of the *Spaniards*, and their Arms; but Gunpowder is what raises in them the greatest Admiration. They wonder at the Whiteness of the *Europeans*, in respect of whom they are perfectly Tawny, as well as the Inhabitants of this Country. It does not yet appear, that they have either any Knowledge of a Deity, or that they worship Idols. Their Life is perfectly Savage, taking care of nothing but Eating and Drinking, in which they observe no set time, but eat and drink at any time or place, when hungry or thirsty, or they can find any thing to satisfy themselves; yet they eat but little at a time, and never enough to suffice for a whole Day. They shew a great Respect and Deference for their King, and Governors of their Towns, and obey them very precisely. Their Civility and Respect consists in taking hold of the  
Hand



Hand or Foot of the Person they honour, and rubbing gently his Face. They have among their Utensils some Saws, not made of Iron, but of a large Shell, called here *Taclobo*, rubbed and sharpen'd upon a certain kind of Stone. They were surpriz'd at a Merchant Ship that was building at *Guivam*, to see the Number of Carpenters Tools that were used about it: They viewed them all one after another, with a great deal of Admiration. They have no Metals in their Country. The Father Missionary made each of them a Present of a large Piece of Iron, which they received with as much Joy, as if it had been so much Gold; and are so afraid it should be stolen from them, that they lay it under their Heads when they go to sleep. They have no other Arms but Lances or Darts, made of Human Bones very well sharpen'd and fix'd on. They are very peaceful of themselves; but if any Quarrel happens among them, it is decided with some Blows on the Head with the Fist, which yet very rarely happen; for when they would come to a close Fight, they separate them, and they are soon reconciled again. They are not dull and heavy, but on the contrary, have a great deal of Liveliness and Courage. They are not so lusty as the Inhabitants of the *Marianas*, but nevertheless are well proportioned, and of a Shape much like those of the *Philippines*. Both Men and Women let their Hair grow long, and hang loose on their Shoulders.

When they understood they were to be conducted to the Presence of the Father Missionary, they painted their Bodies all over with a Yellow Colour, which is look'd upon by them as a great Beauty. They are so well satisfied with finding here Plenty of every thing that is necessary for Life, that they offer'd to return home, and bring with them their Countrymen to enter into a Commerce with these Islands: Which design our Governor liked very well, in hopes thereby to gain this Country to the King of *Spain*. The oldest of these Strangers was once before cast on the Coast of *Caragan*, in one of our Islands; but finding there none but Infidels, that lived in the Mountains and Desarts, he returned home again, without knowing any thing of the Plenty and Riches of these Islands. They are very expert at Diving; and they say, they lately, in Fishing, took two large Pearls in their Shells, but threw them into the Sea again, not knowing the Value of them.

2. These Islands are situate between the *Molucca's*, the old *Philippines*, and the *Marianas*. They are eighty seven in Number, and make one of the finest *Archipelago's* in the East; being inclosed on the North and South between the Line and the Tropick of *Cancer*, and on the East and West between the *Marianas* and *Philippines*. The Map was not made by *Europeans*, for none have yet been upon these Islands, but by the Islanders themselves, after this manner. Some of the most skilful of them ranged upon a Table as many little Stones as there are Islands belonging to their Country; and marked out, as well as they could, the Name of each, its Extent and Distance from the others: And this is the Map, thus traced out by the *Indians*, that is here ingraved. The Natives never offer any

From Fa.  
Le Gobien,  
*ibid.* p. 196.



Violence to one another: Murder and Homicide are unknown to them; and they have a Proverb among them, That *one Man never kills another*. It is probable these Islands may abound in Gold, Amber and Drugs; being situate nearly under the same Degree of Longitude as the *Molucco's*, from whence we have Nutmegs, and other valuable Spices.

Tho' these People seem barbarous to us, yet they have among themselves a sort of Politeness and regular Government. Every Island obeys its Chief, who himself is subject to the King of the Country. This Prince holds his Court in the Island of *Falu*, called likewise *Lamuirec*; which multiplicity of Names seems to be the reason why we cannot find in this Map scarce any of the Names mentioned in Father *Clain's* Letter; or perhaps, because at first from the Natives Pronunciation of the Names of their Islands, they were written by the *Spaniards* after a different manner from what they are at present. Tho' these Islands were never heard of in *Europe*, 'till within these five or six Years, yet 'tis a long time since, from the high Mountains of *Samal*, they have discover'd thick Smoaks on that Coast; which commonly happens in Summer time, when these Islanders set fire to the Woods and Forests to clear up the Ground. These Smoaks, which the Fishermen of *Mindanao* and other Islands, have also observed when far out at Sea, have made them conjecture, that there was Land East of the *Philippines*; but they never had any certain knowledge of it, till some time before the abovemention'd Arrival of these Islanders at *Samal*: Which happened thus,

The King's Brother of these new *Philippines*, in a Sea Voyage, was driven on the Coast of *Caragan*, in the great Island of *Mindanao*. The *Spanish* Fathers, who have a very fine Mission there, received this Prince with a great deal of Honour and Friendship, and instructed him in the *Christian* Religion; which he was so well pleased with, that he never thought of returning again to his own Country. In the mean time the King, dissatisfy'd at the Loss of his Brother, fitted out a Fleet of an hundred small Vessels, which he sent to every Island under his Dominion, to see if they could learn any News of him. One of these little Vessels was forced by a Storm on the Coast of *Caragan*, at the same place as the King's Brother was before. Where landing, they immediately knew him, and with Tears told him the occasion of their Journey, the Discontent of the King his Brother, and desired him to return back with them. The Prince thanked them for the trouble they had been at, and desired them to satisfy the King, that he was well and contented, but could not, by any means, be persuaded to return home again.

Explanation  
of the Map.  
Plate 14.

The Figure in the midst of every Island, shews how many Days Sail it is in Circumference.

The Figure between each Island, shews how many Days are required to pass from one to the other.



# A MAP OF THE NEW PHILIPPINE ISLANDS

Plate XIV. Part IV. P. 196.



A. Johnston Sculp.







As for Instance. Fig. 30, in the Isle of *Panlog*, shews that it is thirty Days in Circumference; and the Fig. 3, between the Cape of *Guivam* and the Isle of *Panlog*, shews, that it is three Days Passage to it.

The *Indians*, who were the occasion of those Islands being discovered, embarked in the Island *Amorsot*, mark'd in the Map by the Letter C, with a design to pass to the Isle of *Paiz*, mark'd by the Letter B; but were driven by a Storm out to Sea, and after seventy Days Sail, cast on the Cape of *Guivam* in the Island of *Samal*, called by the *Spaniards*, *Ibabao*.

A, The largest of these Islands, named *Panlog*.

D, The Isle of *Falu*, or *Lamuirec*, where the King holds his Court.

XV. This Country furnishes Materials for mechanic Arts and Sciences more than any Country that I know of. The Artisans here have wonderful Skill and Dexterity: They excel particularly in making Linen Cloth; which is of such fineness, that very long and broad Pieces of it may easily be drawn thro' a small Ring. If you tear a piece of Muslin into two pieces, and give it to one of their Fine-Drawers to set it together again, it will be impossible for you to discover where it is joyned, tho' you mark it on purpose to know it. They will place together so artificially the Pieces of Glass or *China* Ware, that one cannot perceive it was ever broken.

*Observations  
on the Mecha-  
nick Arts and  
Physick of the  
East-Indians,  
in a Letter  
from Bengale  
n. 337. p. 225*

Their Embroiderers work in Filigreen very curiously: They imitate exactly any Work made in *Europe*, tho' the Engine they make use of, and all their other Utensils, do not cost them above the value of a Crown. The Looms that their Weavers use do not cost them more: With these they sit in their Courts and Yards, or on the side of the Highway, and work those fine Stuffs, that are so highly esteem'd over all the World. They have here no need of Wine to make *Aqua Vitæ*; but make it of a Syrup, Sugar, some certain sorts of Barks and Raisons; it burns better, and is stronger than that made in *Europe*. They paint Flowers, and gild very fine upon Glass. I was surpriz'd to see their Vessels, which they use to cool Water in, and are not thicker than two Leaves of Paper pasted together. Their Watermen row after a different manner from ours. They move the Oar with their Feet, and their Hands serve instead of the *Hypomochlion*, or Roller on which it turns. The Liquor which the Painters use, does not any way lose its colour, nor is it tarnish'd by Lye. The Husbandmen in *Europe* prick their Oxen with a Goad to make 'em go faster; but here they only twist or wring their Tails. These Beasts are very docile: They teach them to lye down, or rise up when they take up or lay down their Burthen. They make use of a kind of Hand Mill to break their Sugar-canes, which does not cost them above the value of ten Pence. The Person, that grinds, works and fashions the Stone himself with Lac and Emery.

Their



Their Masons will pave the largest Room with a sort of Cement made of Brick Dust and Lime, so that it shall seem to be but one Stone, and is much harder than Gravel. I saw them make a sort of Pent-house, that was forty Foot long, eight Foot broad, and five or six Inches thick; which they raised up in my Presence, and fixed it to the Wall on one side only, without putting any Prop under it to support it. Their Pilots take the Altitude (or Latitude of Places) with a Cord that has several Knots in it. They put one end of the Cord between their Teeth, and by means of a piece of Wood fixed to it, that has a Hole through it, they easily observe the Tail of *Urfa minor*, which is commonly called the Polar Star, or North Pole. Their Lime is usually made of Sea Shells: That which is made of Snail Shells serves to whiten their Houses; and that which is made of Stones they chew with the Leaves of *Betel*. I have seen some of them that would take as much of it in a Day as the quantity of an Egg. They make their Butter in the first Pot that comes to hand: They cleave a Stick into four Quarters at one end, and stretching them out a sunder in proportion to the size of the Pot that contains the Milk, they turn the Stick round different ways (backwards and forwards) by means of a Cord twisted about it; and by this means in a short time make the Butter. Those that sell Butter have the Art of making it pass for fresh, when it is old and rank. To do this, they melt it, and pour upon it sour curdly Milk; and in eight Hours after they take it out in Lumps and strain it thro' a Cloath for sale.

Their Chymists make use of the first Pot they meet with to revive Cinabar and other Preparations of Mercury, which they do after a very simple manner. They easily reduce all Metals into a Powder; as I myself can witness. They set a great value upon Talk and Brass, which consume, as they say, all viscous Humours, and remove the most stubborn Obstructions. Their Physicians are more cautious in using Sulphur than they are in *Europe*: They correct it with Butter; and put Broth upon it made with long Pepper, in which are boiled the Kernels of the *Indian Pine-Apple*. Wolfs-bane corrected in Cows Urine, and Arsenick corrected with the Juice of Lemons, they use with success in Fevers. A Physician is not permitted to take care of a sick Person, unless he can guess at his Disease, and what Humour is most predominant; which they easily know by feeling the Pulse of the Patient; nor are they often deceived. The principal Diseases that reign in this Country, are, 1. The *Mordechin*, or *Colera morbus*: The means by which they cure it, is by not suffering the Patient to drink, and by burning the Soles of his Feet. 2. The *Sonipat*, or Lethargy; which is cured by putting into the Person's Eyes bruised Pepper mixed with Vinegar. 3. The *Pilhai*, or Obstruction of the Spleen; for which they have no Specific Remedy, unless it be that of the *Joghis*, (or converted *Indians*;) They make a small Incision under the Spleen, and put in between the Skin and Flesh a long Needle; from whence by sucking with the end of a Horn, they draw



draw out of the Orifice a kind of a fat Matter that resembles *Pus* or Corruption. Most of the Physicians have a Custom of putting a drop of Oil on the Urine of the sick Person: If it spreads abroad, they say it is a sign that the Patient is very hot within; but on the contrary, if it keeps together intire, it is a sign that he wants Heat.

The common People use very simple Medicines. For the Megrims they smoak, like Tobacco, the dry'd Bark of a Pomgranate Tree reduced to a Powder, and mix'd with four Corns of Pepper. For the common Head-ach, they smell to a *Nodule*, compos'd of a Mixture of *Sal-Armoniac*, Lime, and Water, ty'd up together in a Linen Rag. Such Dizzinesses of the Head, as proceed from a cold thick Blood, they cure by drinking Wine, in which are steep'd a few Grains of Frankincense. For Deafness, occasioned by too great a quantity of cold Humours, they drop into the Ear a drop of Juice of Lemon. When the Brain is charged and oppress'd with watry Humours, they smell to black Cummin-seed bruised and tied up in a Nodule. For the Tooth-ach, they put upon the Tooth affected a Paste made of Crums of Bread, and the Seed of the *Stramonium*, which stupifies the Part affected, and eases the Pain. In an Hæmorrhage, or Flux of Blood, they make the Person smell to bruised Mother-wort, or Wormwood. For a too great heat of the Breast, and spitting of Blood, they cover with Paste a *Giraumont*, (which is an *Indian* Fruit like a *Gourd*, and tastes like a *Citrull*,) which they bake in an Oven, and drink the Water that comes from it. For the Cholick that proceeds either from Wind and watery Humours, they give to drink four Spoonfuls of Water, in which Aniseeds and a little Pepper have been boiled to a Consumption of half. They also bruise an Onion with Ginger, and apply it to that part of the Belly where there is most Pain. For the Lientery, they roast a Clove of Garlick under the Ashes, and when they go to Bed they hold it in the Mouth and suck out the Juice of it. If they drink the Juice of the Leaves of Cucumber bruised, it Purges and Vomits them. They cure a Difficulty of Urine, by drinking a Spoonful of Oil of Olive well mixed together, with a like quantity of Water. For a Looseness, they torrify a Spoonful of white Cummin-seed, and a little powdered Ginger, which they swallow mix'd with Sugar. I have seen them cure Fevers which begin with a shivering Fit, by giving the Patient three large Pills made of Ginger, black Cummin and long Pepper. For *Tertian* Agues, they give the Person for three Days together three Spoonfuls of the Juice of *Teucrium*, or great Germander, with a little Salt and Ginger.

XIV. 1. On the 12<sup>th</sup> of *May* 1707, there began to rise up an Island a Musket-shot distant from the Island of *Sant-Erini*, which continually increasing from Day to Day in the same manner, and troubling the Sea, there arose up several Rocks, that fixed themselves to this Island; so that at this time it is about half a Mile in Circumference.

*An Account of  
a New Island  
rais'd in the  
Archipelago,  
communicated  
by Dr. She-  
rard to Mr.  
Petiver. n.  
314. p. 67.*

*Conflan-*



From the Paris Gazette,  
Ap. 14. 1708.

Plate 15.

2. *Constantinople, Jan. 4. 1708*, They write from the Island of *Sant-Erini* in the *Archipelago*, about twenty eight Leagues North of the Town of *Candia*, of the first of *December* last, that there was sprung up an Island from the bottom of the Sea, which at that place is very deep, formed of Stones cast up by a *Volcano* under-ground at the bottom of the Sea, which has often produced the same Effects, and after the same manner. In the Year 726, in the time of the Emperor *Leo Isauricus*, there was found an Island on the North side, called the *Burnt Island*, by Matter vomitted up and heaped together by this *Volcano*. In the Year 1427, in the Month of *December*, this *Burnt Island* was increased by great Rocks cast up by subterraneous Fires. In the Year 1650, in the Month of *September*, the *Volcano* again took Fire, and produced the same Effects, without forming any Island, but only a Shelf or Bank ten Fathom under Water in the Sea, where it has no Bottom. Lastly, In the Month of *November* 1707, the *Volcano* made an Island, which is already two Miles in Circumference, and increases yet (this first of *December*) by Rocks and other new Matter that is thrown up. This Burning was preceded, as at all other times, by violent Shakings of the Earth, followed by a thick Smoak that rose out of the Sea in the Day time, and Flames in the Night, and accompanied with a terrible roaring under Ground. There is no Example of the Effects of any *Volcano* at Land like these in the Sea; and yet what renders them the more credible, is, that the Island *Sant-Erini* it self, is almost all of it composed of Burnt Rocks and Pumice-stones: It produces some sorts of Grain, but has neither Rivers nor Springs, nor any other Water but what is saved in Cisterns.

A farther Relation, by Father Goree, an Eye-witness. n. 332. p. 355.

3. This is not the first time that these Prodigies have been seen at *Santorini*: For, if it be not true, that this Island it self, which was anciently call'd *Thera*, was in like manner raised out of the Sea (as *Pliny* assures us it was,) it is at least most certain, that three other small Islands (two of which lye within the Bay of *Santorini*, and the third a little without it) have been formed and raised up above the Sea by subterraneous Fires.

The first of these Islands, which was anciently call'd *Hiera*, because it was (as is thought) dedicated to *Pluto*, is now named *Megali Kammeni*, that is to say, the Great *Burnt Island*. *Justin* (l. 30. c. 4.) speaking of the first War of the Romans with the *Macedonians*, and of the two Months Truce with *Philip* King of *Macedon*, and Father of *Perseus*, then demanded, and which he obtain'd, according to *Salianus*, the fourth Year of the one hundred and forty fifth Olympiad, and the one hundred and ninety sixth Year before the Birth of our Lord, tells us, that this Island rose up from the bottom of the Sea this very Year after an Earthquake.

It became half as big again, in the Year of our Lord 726, by the joyning of another Island to it; which, according to the Relation of *Theophanes* a Greek Author cited by *Baronius*, rose also out of the Sea, and raised itself exactly to the same height as the Island *Hiera*, and united so well to it, that at this time there remains no other Mark of its joyning, than only a











a Cleft or Fissure, which reaches from one End of the Island to the other, and in several Places is not half a Foot broad. The same thing happened a second time in the Year 1457, as appears by a *Latin* Inscription upon a Marble at *Santorini*: But with this Difference, that the subterraneous Fire, after having raised to the Height of five or six Foot above the Water, a vast Quantity of Rocks, which formed a Space about a Mile in Circumference, opened a Passage for the Sea-Water to enter, by which it was extinguish'd; and the middle of that Space remain'd so low, that the Sea flowing into it by a subterraneous Canal, made there a small Lake, which continues to this Day.

As to the second Island, which is a little without the Bay, and is call'd in *Greek* *Aspronisi*, or the *White Island*, because the Earth, with which it is covered, is white like Lime; *Pliny*, who lived in the time of the Emperor *Vespasian*, says, that it rose out of the Sea, and appeared in his time.

The third Island, which is the least, and is called by the *Greeks* *Mikri Kammeni*, or the *Lesser Burnt Island*, was formed in the Year 1573, according to the Relation of several old People, who learned it of their Ancestors: and it is between this little Island and the Great *Kammeni*, that on the 23<sup>d</sup> of *May* (New Stile) in the Year 1707, at break of Day, the New Island, of which I am now going to speak, was first discovered.

Five Days before it appeared, viz. on the 18<sup>th</sup> of *May*, between one and two of the Clock in the Afternoon, there was at *Santorini* an Earthquake, which was not violent, and continued but a Moment: And in the Night between the 22<sup>d</sup> and 23<sup>d</sup>, there was also another, which was yet less sensible than the former.

It is natural to imagine, that it was then the New Island first began to move and raise itself from the Bottom of the Sea: Yet, if we consider, that these two Earthquakes were not violent, and lasted but a Moment; and that the Bottom of the Sea was in this Place from eighty to a hundred Fathom deep, it seems difficult to believe, that in five Days time, it could rise to this Height. What inclines me to think the contrary, is, that the Height it is at present above the Surface of the Sea, and which it did not arrive to in less than three Yearstime, is much less than that from the Bottom of the Sea to the Surface of the Water, as I shall shew hereafter. Add to this, that a long time before these Earthquakes, the Fishermen perceived an ill Smell every time they passed by that Place; which shews that the Island had then begun to move: Notwithstanding it is very certain, that there have not been any other Earthquakes at *Santorini*, than those which, fourteen or fifteen Years ago, continued for several Days, and were violent. Howsoever it was, some Seamen discover'd this Island early in the Morning; went immediately to it; but as soon as they found that it was a New Island, they return'd back, and spread the Report over the whole Island; which was the more readily credited, because several of the Inhabitants had themselves seen what happen'd in the Year 1650.



There was then a New Island, like to the present, which, between the Islands of *Santorini*, *Nio*, and *Andro*, rose up by means of subterraneous Fires, which caused several violent Earthquakes, accompanied with a roaring Noise under Ground, sulphureous Exhalations, an insupportable Stench, and a black Smoak, which rose out of the Sea, with Flames to the Height of ten or twelve Cubits. The Sea was then so tossed backwards and forwards by the terrible Shocks of the Earth, that it overflowed and destroyed thirty thousand Perches of Land in *Santorini*; and the Air was so infected with Exhalations which came from the Fire, that twenty five Persons, and a great many Beasts, were stifled. At last, when this Island had not above eight or ten Fathom of Water to rise, so as to appear above the Surface of the Sea, the Force of the subterraneous Fire was so violent, as to open a Passage before its time, by which the Water of the Sea entring like a Torrent, extinguished the Fire, and this Mass of Earth and Stones did not rise any higher. Let us now return to our new Phænomenon.

Some of the Inhabitants of *Santorini* took a Resolution to go and view the Situation of it: Which they did accordingly; and not imagining any Danger, went on Shore upon it. They passed from one Rock to another, upon which they met with several very remarkable Curiosities; among which we may reckon a sort of white Stone, which cuts like Bread, and resembles it so well in Form, Colour, and Consistence, that were it not for its Taste any one would take it for real Bread. But what pleased them more, was a great Number of fresh Oysters which they found sticking to the Rocks; which being very scarce in that Country, by reason of the Depth of the Sea, they got as many of them as they could. While they were busy about this, they perceived the Island move and shake under their Feet. This was sufficient to make them leave it immediately. In short, the Rising of the Island was visible to the Eye, and it increased not only in Height, but also in Length and Breadth. Though it was already between fifteen and twenty Foot high above the Sea, it could not yet be seen from the Mountain *Merovigli*, or the Castle of *Scaro*, which stands upon the Shore, by reason the Lesser *Kammeni*, above mentioned, lay between, and hinder'd the Sight: But at fifteen Days end, they began to see it from *Merovigli*, and a few Days after, from the Castle of *Scaro*, situated upon another Mountain, which, though it be very high, in respect to the Sea, yet it is much lower than that of *Merovigli*, to which it joins. From whence we may judge how much this New Island grew in Height in a few Days.

As the Motion, by which this Island increased every Day in Height, was sometimes equal, and at other times unequal, in respect to all the Parts of so great a Mass; so did it not always rise equally on every side. It often happened, that while it grew in Height and Length on one side, it sunk down and decreased on the other. I one Day saw a Rock rise out of the Sea, at forty or fifty Paces distant from the Island, which I continued



to observe for four Days together ; at the End of which time it sunk again into the Sea, and did not appear any more : But this was different from what happened to some others ; which having disappeared, as this did, they re-appeared again some time after. The Lesser *Kammeni*, which lies very near, was often shaken with the Motion which raised this New Island. From a small Cleft, which we observed upon the Top of this little Island, sometimes Stones would break loose ; which rolling down its Sides into the Sea, would raise as it were a Cloud of Dust, which some People took to be Smoak, but in reality it was not so.

At this time, the Sea, which is contained within the Gulf or Bay of *Santorini*, several times changed its Colour : At first it appeared Green, afterwards Reddish, and sometime after of a Yellowish Colour ; with a Stink, which spreading itself over great Part of *Santorini*, made us imagine that this Colour proceeded from nothing else but the Sulphur with which the Sea was covered.

The Smoak appeared first upon the 16<sup>th</sup> of *July* : At which time, from a Place in the Sea, where (they assured me) they could never before find any Bottom, and which was above sixty Paces distant from the New Island (which they then called the White Island) there rose up a Ridge of black Stones, which the *Greeks*, by reason of their Hardness, call *Sideropetres*, or Iron-Stones, which formed another Island, named by the Inhabitants the Black Island ; and which was afterwards not only the Center of the whole Island, but also of the Fire, and Smoak, and great Noise, that was heard some time after. The Smoak, which issued out of this Ridge of Stones, or Black Island, was very thick and white, as if it had proceeded from five or six Lime-Kilns joined together ; and being carried by a North Wind towards the Castle of *Acrotiri*, it went into the Houses of the Inhabitants, but without causing any great Annoyance, because it had no very ill Smell. Four Days after the Smoak had thus appeared, they saw in the Night time Fire issuing out from the same Place, which however, was then but very little, being not above the Breadth of the Mouth of a Furnace, and did not appear in the Day time, but only in the Night, from Sun Setting to Sun Rising ; and was so far from spreading the whole Length of the Ridge of Stones above mention'd, that it possess'd but one small Part of it, which was always afterwards the common Passage for the Smoak and Fire, which I shall speak of hereafter.

As for the first Island, or White Island, we did not see there either Fire or Smoak ; yet it continued to grow bigger ; but the Black Island increased much faster. We saw every Day great Rocks rise up on every Side of it, which made it sometimes longer, and at other times broader ; and by the Height of them we could very nearly judge how many Foot it rose up every Day or Night. Sometimes these Rocks joined to the Island, and at other times they were at a Distance from it ; so that in less than a Month, there were four little Black Islands, which in a few Days after, united together, and made but one Island.



As the Smoak encreased very much, and there was no Wind stirring, it rose up to the middle Region of the Air, so as to be seen (as several credible Persons assured me) at *Candia*, *Naxos*, and other Islands; and in the Night time it appear'd of a Flame to fifteen or twenty Foot high. The Sea was at that time covered with a Matter or Froath, which in some Places was reddish, and in others yellowish; from whence there proceeded so great a Stench over the whole Island of *Santorini*, that for fear of being infected, several Persons were obliged to burn Incense, and others to make Fires upon the Tops of their Houses, to disperse it and to purify the Air. By good luck it did not continue above a Day and half; for a strong South-West Wind arose, which together with the Motion of the Sea, did indeed disperse this froathy Matter, but occasioned otherways a great Damage to the best Part of the Island of *Santorini*. At that time they were in great Hopes of having shortly a very plentiful Vintage; when this Wind carried all the Smoak on upon their Vineyards, which burnt them up in such a manner, that the Grapes (which were not yet ripe) turned in one Nights time like dried Raisins, so that they were forced afterwards to throw them away, because of their Sownerness.

It is farther remarkable, that Silver and Copper were changed black by it: And tho' some People, who were forced to pass through the Smoak in going to their Houses, assured me that it had no very ill Smell with it; yet several of them were, that and the next Day after, troubled with great Pains of their Head. At this time the White Island, which (as I have said before) seemed to be above the Lesser *Kammeni*, and could be seen from the first Floor of their Houses in the Castle of *Scaro*, sunk down so low, that it could not be seen from the second.

Hitherto the Sea had not been observed to boil up, or any Noise heard upon the Black Island: But upon the 31<sup>st</sup> of *July*, the Sea was seen to emit Smoak at two several Places; one of which was about thirty, and the other above sixty Paces distant from the Island. In these two places, both of which were perfectly round, the Water of the Sea looked like Oyl, and seemed to rise up and bubble: Which it continued to do for more than for a Month; in which time there were a great many Fishes found dead on the Shore, occasioned by their happening to have been too near these two places.

The Night following there was heard a dull hollow Noise, much like that of several Cannons shot off at a distance: And at the same time there was seen to rise out of the midst of the Funnel Flames of Fire, which darted very high into the Air, and disappeared immediately. Next Day there was heard several Returns of the same Noise, which was followed by a Smoak, not white, as usual, but blackish; and which, notwithstanding a very fresh North Wind, rose up in a Moment a prodigious Height, in form of a Column, and in the Night time would, in all probability, have appear'd, as if it were all on Fire.

*August*



*August* the 7<sup>th</sup>, the Noise alter'd; and from being dull, as before, it became very loud, and resembled the Noise which is made when several great Stones are thrown all together into a very deep Well: And I really believe that this great Noise was occasioned by several large pieces of Rocks, which after having been raised up with the Island by the Violence of the Fire, broke of by reason of their weight, and fell back again into the Subterranean Caverns. What confirms me in this thought is, that I saw then the ends of this Island in so great a Motion, that after having appear'd for some Days, they then disappear'd, and afterwards re-appear'd again anew. Howsoever it was, this Noise after having continued so for near a Month, was followed by another much louder and more extraordinary: It so nearly resembled Thunder, that when it did really thunder, as it happen'd to do three or four times, there was very little difference between the one and the other. As the Passage, which the Fire had made it self by its Violence through so many Rocks, was not, in all probability, in a streight Line, and was in some places narrower, and in others larger and more free; so it is probable, that the Fire, or rather the Sulphureous and burning Exhalations, caused this great Noise, by turning from side to side in these winding Caverns, and endeavouring to get a Passage out, which was difficult for them to find: Which was the cause that the Noise of this Subterraneous Thunder was sometimes not so loud, and a little while after grew more violent, and sometimes was so stunning, that People talking together could scarce hear one another speak; and that the black Island, which was already very high, seemed to crack on every side; and in short, that the inclosed Fire, after several Windings and Turnings, having collected a sufficient force, was able to break out with a Noise equal to that of several Cannons discharged at once.

*August* 21. the Smoak diminish'd considerably, as also the Fire: There did not appear any in the Night; but the next Day both returned with greater Force than at any time before. The Smoak was reddish and very thick, and the Fire so great, that the Water of the Sea smook'd and bubbled up all round the black Island. I had in the Night the Curiosity to view with the Telescope the great Fire that appeared upon the Mountain of this Island, and I number'd sixty Openings or Funnels, which threw out all of them a very bright Fire, and were divided from one another by Rocks. In all Probability there were others, and perhaps as many, on the other side of the Mountain, which I could not see. Next Morning I observ'd that the Island had been very much raised in the Night; that a Range of Rocks about fifty Foot long was rose out of the Water, which made the Island broader than it was before; and that the Sea was almost covered over with the reddish froathy Matter above-mentioned. This Matter, or Froath, appeared upon the Sea every time that the Island increased considerably; and occasioned a Stink, much like that of the Sink of a Ship: Which we may imagine to arise from



from a slimy Earth mixed with Sulphur, which being raised up with the Rocks, and coming to be washed off by the Waves, was loosened and diluted by the Water, and so sent up to the Surface the Salts with which it was loaded.

The Fire had hitherto appeared but only in one place, upon the Top of the black Island; but on the 5<sup>th</sup> of *September* it made it-self another Passage, and appeared at the End of that Island, on the side next *Terasia*, which is another Island, which some Authors say was formerly joyned to that of *Santorini*, and was separated from it by an Earthquake. The Fire did not continue at this End but a few Days, during which, it decreased at the place whence it used commonly to issue out. And here we were very agreeably surpriz'd, in seeing the Fire three several times dart out from this place without any Noise, and rise up in the Air like a large Rocket. The following Days there was much the same Spectacle; for the Subterraneous Thunder, after having made a great Noise, broke out from time to time with a Clap as loud as that of a Cannon, and was accompanied with a very beautiful and large Fire, which shooting up in an instant to a great Height, fell again on the Island, and illuminated it almost all over. I cannot better represent the Figure that the Fire made in the Air, than by comparing it to a certain Artificial Firework I have seen in *France*, and is there called the *Gerbe*: But with this difference, that this Fire, of which I am speaking, rose much higher, and was much larger, but not so distinct as that of the *Gerbe*. Immediately after the Fire was darted out, as I have said, in the manner of a Rocket, there appeared in the Air a Blaze, in the form of a long fiery Sword, which continued some time, without moving, over the Castle of *Scaro*, and afterwards disappeared. At that time also, the white Island and the black Island, having increased in length, in proportion as they rose in Height, united together; and the End of the black Island, towards the South-East, began not to increase any more, either in Height or Length, while the End toward the West increased very sensibly to the Sight: Which makes me imagine, that the Mines of Sulphur being at this place, and the Fire not finding any Passage out here, had force to raise up this part and not the other; for in the middle of the Island it always found Openings to issue out at, together with the Smoak. It had then four Passages there, which were so near one another, that one could not well distinguish them asunder, but by the Smoak: I do not mean that Smoak which commonly issued out and was continual, but that which rose up at some certain times with a great force; for this Smoak came forth sometimes from one Passage, and sometimes from another, and oftentimes out of all four together; sometimes with a great Noise, and at other times without any Noise at all, tho' then also it issued out with the same impetuosity. Out of these Passages also there came a whistling Noise, like that of an Organ Pipe; which, by the variety of Sound it made, pleased the Inhabitants as often as the Subterraneous Thunder ceased.



One would think, that the Noise of this Thunder should not then be so loud, by reason of the several Passages of which I have spoken; yet, notwithstanding, it was not at any time so great and so frequent as it was then, and as it was above six Months after. It was then, as I said, like the Report of a Cannon: And there did not pass a Day or a Night, but we heard five or six, sometimes ten or twelve of them; and at the same time several great burning Stones were thrown into the Air; some of which falling one Day upon the great *Kammeni*, set fire to some Thickets of Bushes upon that little Island; and others being cast a great way into the Sea, had certainly destroyed a small Vessel that passed by at above a Miles distance, if it had gone by never so little later. These Claps were always attended with this Smoak I have mentioned, which was very different from that which issued out continually from the Gulf of Fire almost in the middle of the Island; for this was much thicker and blacker, and rose in an instant much higher, and was not dispersed 'till some time after, and then fell in Ashes upon the Country, or into the Sea; some of which the Wind sometimes carried as far as *Anacuphi*, an Island about twenty five Miles distant from the Bay of *Santorini*. Some Persons had the Curiosity to gather some of these Ashes (which were of a Colour between black and white) and put them into the Fire, imagining they would burn like Gun-powder, which they very much resembled; but they produced no other effect, than only making a small hissing Noise.

September the 18<sup>th</sup>, two Hours after Midnight, there was an Earthquake at *Santorini*; with which they were the more surprized, because they least suspected it, the Subterraneous Fires having had so free a Passage for so long a time. It did not do any damage; and had no other effect than to enlarge very much the Island, and to remove for some Days the Fire and Smoak into other places, through new Passages which it made, and to increase very considerably both of 'em. And in truth, I never saw so much Fire, or heard such terrible Claps, as after this Earthquake. By the Violence of these Claps, Houses were shaken at above three Miles distance; and out of the midst of a great Smoak, which rose up and appeared like a Mountain, one might see and hear great pieces of Rocks fall down into the Sea and upon the Island, which were thrown out with the same Violence and Noise as a Bullet out of the Mouth of a Cannon. The lesser *Kammeni* was several times quite covered over with great Stones cover'd with burning Sulphur; several of which rolling afterwards from the top of this little Island into the Sea, made a very bright Light and pleasant appearance in the Night. I thought at first, that the Fire had passed under-ground from the New Island to this; because they are not very far asunder: But I soon found my mistake, and that this Fire proceeded only from these Stones sulphur'd over; for the Sulphur, which which they were crust'd over, being consumed, they were all extinguish'd in half a quarter of an Hours time, except some.



some few which remained a light above half an Hour. One Day, when the lesser *Kammeni* was all on Fire, after one of these furious Claps, and the Air was so too, thro' the frequent Flashes of Fire that appeared in the Clouds, we saw, by a surprizing Accident, three Flashes come out of the places where the Fire was, which one could not distinguish from real Lightning, but that they were formed lower, and were at the two Ends of the Island. By the Violence of one of these Claps, part of the top of the New Island was carried off into the Sea, and several Stones were thrown to above two Miles distance: And, as if the Mine had been exhausted by this great Clap, three or four Days passed without any Noise, and almost without any Fire or Smoak. They thought then, that they should have seen an end of it: But the Fire kindled again, and the Island became more terrible than before. I was then at a Village six Miles distant; where we heard so distinctly (notwithstanding it lay under a Mountain) the Blast of the Mine, that the Inhabitants were so frightened at such an extraordinary Clap, that I was forced to put 'em in Heart. At my return to the Castle of *Scaro*, I found the People much more alarmed than they were in the Village; and was informed immediately, that the Castle had suffered so violent a Shake, that the Doors of the Houses, and the Windows that were shut, were opened by the Force and Violence of the Clap.

*February* the 10<sup>th</sup> 1708, at half an Hour after Eight of the Clock in the Morning, there was another Earth-quake at *Santorini*; and some Persons assured me, that there was another the Night before, but not so sensible as this. If we may judge by what is past, our *Volcano* is so far from drawing shortly to an End, that it gets new Force by other Veins of Sulphur, which take Fire at a great distance. We have Instances of this in the Fire and Flames which rise so frequently into the Air, and fall again over the whole Island, making in the Night time as fine a Spectacle as was ever seen in Artificial Fire-Works. Besides, this, several great Rocks, joyning to the Island, which before were even with the Water, have been raised much higher; and the Noise, Smoak, and Boiling of the Sea, increase so much, that though the Inhabitants of *Santorini* have been so long accustomed to see all these things, yet they could not help being more afraid than before. And certainly not without reason; for the subterraneous Noise was more violent than ever, and continued several Days together without any Intermision; and in the Space of a Quarter of an Hour the Mine discharged itself five or six times; the Noise of which, with the great Quantity of Stones it threw into the Air, the Shocks it gave the Houses, and the Fire which appeared in open Day (which was never seen before) very much surpasses all that I have before spoken of it.

The 15<sup>th</sup> of *April* was remarkable above all other Days, for the great Number and Violence of the Claps; by one of which near 100 great Stones were mounted up all at once into the Air, and fell again at above two Miles distance in the Sea. Though I was then about three Miles off



off from the New Island, I observ'd one of a surprizing Greatness, which did not rise so high as the rest, but was driven farther, in a strait Line, like a Cannon Ball.

From the 15<sup>th</sup> of *April* to the 23<sup>d</sup> of *May*, which was a Year from the Birth of this New Island, what I have described above, continued the same; and I did not observe any thing more in particular, unless it were that the Island increased in Height and not in Length; and that one furious Clap beat down at once all the Top of it; which by means of the Ashes and Stones of all Sizes that fell upon it Day and Night, was not only repaired, but made much higher than it was before. All Particulars began to abate afterwards: The Smoak decreased; the subterraneous Noise was not so violent; and the Claps, though they were very frequent, were not however so loud, by reason that the Funnel, which gave a Passage to the Fire and Smoak, were then much larger than they were before.

Seeing there was no Danger, I went in Company with *Francis Crispo* the *Latin* Bishop of *Santorini*; who, as well as myself, had not seen it before but at a Distance, and had the same Curiosity as my self to view it and take all the Dimensions of it. And as our Design was to go ashore upon it, if possible, we went directly to it; to do which, we were obliged to pass over a Place, where the Sea smok'd very much, but did not bubble. We were no sooner come to this Place, but we perceived a Heat strike upon our Faces; which was nothing else but the Fumes of the Sulphur, in the midst of which we were at that time. The Seamen bid us put our Hands into the Water; which we did, and found it so very hot, that having taken them out again immediately, the Bishop bid them make what haste they could away; saying pleasantly, that *that Place was too hot to tarry there long*. What surpriz'd and griev'd me at the same time was, that we were then 500 Paces off from the New Island, and that I had no time to sound the Depth of this Place. From hence we went directly over to that Part of the Island, where it had encreased in Length, and where there was more Danger; for seeing that the Smoak was very thick, which shewed that there was a great Fire all thereabout, we did not think it safe to go any nearer, and so satisfy'd our selves with viewing only the Space that was between this New Island and the Lesser *Kammeni*; which I found to be broader than I imagined, and judged that a Galley might pass through the narrowest Place of it. After this, we went on Shore upon the Great *Kammeni*, that we might from thence view nearer, and without any Danger, the whole Burning Island, and especially that Side of it which we could scarce see from the Castle of *Scaro*. From hence it was, that we judged this New Island to be about two hundred Foot in Height, five Miles in Circumference, and a Mile over at its broadest Part. As to the Form of it, it is oblong, and resembles in some measure the Figure of a Dragon; as may be seen by the Design of it, which I took from this Place.

After having tarried some time upon the Great *Kammeni* (where we had the Pleasure to see often, not far off, a great many Stones thrown vio-



lently out of the Gulf of Fire, and fall down again with a terrible Noise upon the Island) we took a Resolution to coast it round, and to go to the other End of it, not doubting but that we might get on Shore there, because that Part of the Island had not increased for several Months, and there did not appear any Fire or Smoak there. We were within a hundred Paces of it, when putting my Hand into the Water, I perceived that it was warm, and that the further we went the hotter it grew. At this Instant the Mine discharged it self; and the Wind drove upon us the thick Smoak, which broke out with such Violence every time the Mine took Fire: And a Shower of Ashes, and little Stones, not larger than common Hail-Stones, falling upon us, we were forced against our Will to quit our Design of going on Shore upon the Island at this Place. This Shower of Stones and Ashes being over, we retired a little by reason of the great Heat of the Water; and letting down our Plummet, we had at this Place ninety five Fathom of Water, without finding the Bottom, our Line not being long enough. Viewing afterwards the Space that was at this End between the Island and the Lesser *Kammeni*, we found in several Places that it was narrower at this Side than at the other; and that if the New Island should continue to grow bigger, several Rocks, which were already half above Water, and rose up nearer to the Lesser *Kammeni*, would in time shut up the Passage and joyn both the Islands together, so as to make a little Port between them, which would be very commodious for the Shipping of *Santorini*. In returning afterward to the Castle of *Scaro*, we passed by the little Port of the Lesser *Kammeni*; and (by reason of its Nearness) could scarce believe what they told us, *viz.* That they could not hear there any of the Noise that this New Island made: Which we found to be true, and that the Height of this little Island was the Cause of it.

During all the rest of the time that I tarried at *Santorini*, to the 15<sup>th</sup> of *August* 1708, (at which time I came away) the Smoak, Fire, and Noise, &c. continued much the same as I have now described them; that is to say, they were always pretty moderate.

This is all that I can say of this *Phænomenon*; all the Circumstances of which I have related so much the more faithfully, because I was the only Person at *Santorini* who kept a Journal of what happened every Day. From my leaving *Santorini*, to this present the 6<sup>th</sup> of *July* 1711, I have received several Letters, and have seen and spoken with several Persons who have come from thence within these few Days, and they all tell me, that the New Island grows still in Length on that Side next *Terasia*: That it is now about six Miles in Compass: That as to the Fire and Noise under Ground, they were more moderate than before; which makes the Inhabitants of the Island hope, that they shall shortly see an End of it.

As for my Part, when I consider, that the Passages which give Vent to the Fire, are very large, and almost in the middle of the Island; and that there is no Appearance that the Fire will ever make a Passage at the  
Bottom



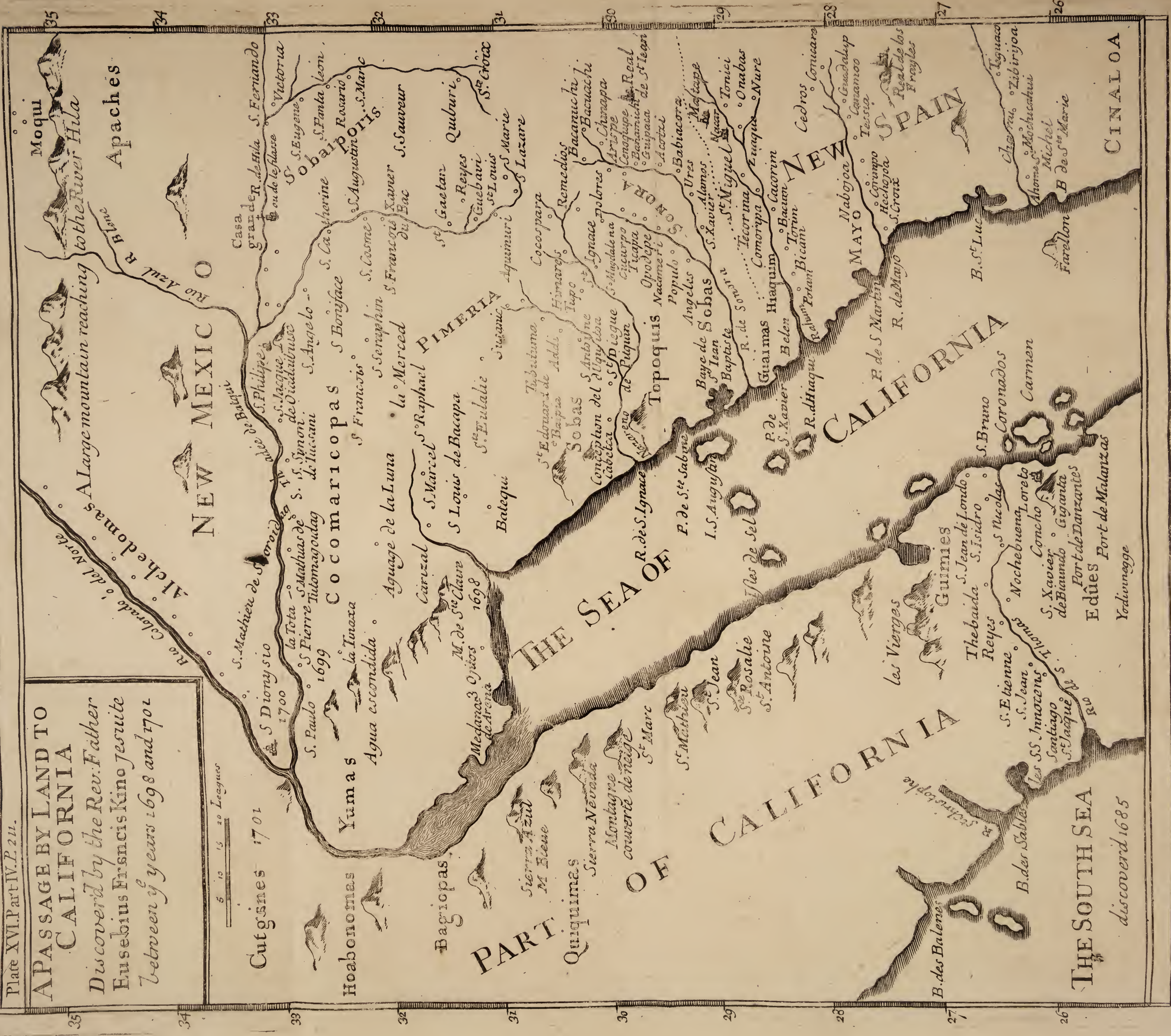




# APASSAGE BY LAND TO CALIFORNIA

Discovered by the Rev. Father Eusebius Francisco Kino Jesuite Between 9 years 1698 and 1702

5 10 15 20 Leagues



THE SOUTH SEA

discovered 1685



Bottom of the Sea, so as to let the Water in to extinguish it; I am of Opinion, that it may yet last longer than they imagine; and that this *Phæ-nomenon* will not have an End, till the Mine of Sulphur is entirely consum'd.

XV. We imbark'd in *October* 1697, and past the Sea that separates *California* from *New Mexico*. As soon as we set Foot on Land, the People being ignorant of our Design, imagining we came to take from them their Pearl Fishery, as had been attempted several times before by others, came in great Multitudes against us, who had but an inconsiderable Number of *Spaniards* to defend us. The Violence with which they attack'd us, and Multitudes of Stones and Darts they threw at us, our Soldiers sustain'd so vigorously, that they beat them back with Success, and put them to Flight. These *Indians*, after this Defeat, became more tractable; and seeing they could not gain any thing on us by Force, deputed some amongst them to come and treat with us. We receiv'd them very friendly, and soon learned of them enough of their Language, to let them know the reason of our coming into their Country. These Deputies undeceived the rest; so that being satisfied of our good Intentions, they came to us in great Numbers, and shew'd a great deal of Joy to see that we were willing to instruct them in our Religion. This happy Disposition encouraged us to study thoroughly the *Monqui* Language; in which, and instructing the People, we spent two Years. After this we thought of discovering other Nations; which that we might do more successfully, the Father *de Salvatierra*, and my self, resolved to separate, and take two different Ways: He went to the North, and I to the South and West. By this means Father *de Salvatierra*, by little and little, discover'd all those Habitations, that at present compose the Missions of *Loretto*, *Concho*, and *St. John of Londo*; and I, all that Country, at present call'd the Mission of *St. Francis Xavier of Biaundo*, which extends it self to the South Sea.

*Of a Passage  
by Land to  
California,  
n. 318. p. 232.*

*Plate 16.*

In proceeding each of us his Way, we observed several Nations of different Tongues mixt together: Some of them spoke the *Monqui*, which we understood; and others the *Laymon*, which we yet knew nothing of. This obliged us to learn the *Laymon*, which is of greater Extent than the *Monqui*, and seems to be Universal in this large Country. We apply'd our selves so close to the Study of this second Language, that we learn'd it in a little time, and began to preach indifferently in either.

*California* is pretty well placed in our common Maps. The Heats in Summer are very great along the Sea-Coasts; and it seldom rains: But the Air of the Inland Countries is more temperate; and the Heat is not so excessive. It is the same in Winter proportionally. In the rainy Season there are Floods; but when that is over, instead of Rain, the Dew falls in such Plenty every Morning, that one would think it had rained; which renders the Earth very fruitful. In the Months of *April*, *May* and *June*, there falls with the Dew a sort of *Manna*, which congeals and hardens



dens upon the Leaves of Reeds, from whence they gather it : It is as sweet as Sugar, though not altogether so white. The Climate must needs be healthy, if we may judge of it by our selves and those that were with us : For during the five Years we were in this Kingdom, we continued very well in Health, notwithstanding the great Fatigues we underwent : And of the other *Spaniards* there died but two ; one of which was a Woman, who occasion'd her own Death, by imprudently bathing her self when she was near Lying-in.

There are in *California* (as in the most beautiful Countries in the World) large Plains, pleasant Vallies, excellent Pastures, at all times, for great and small Cattle ; fine Springs of running Water, Brooks and Rivers, with their Banks cover'd with Willows, Reeds, and wild Vines. In their Rivers they have Plenty of Fish, especially Cray-Fish, which they keep in a kind of Conservatories, till they have occasion for them : Three of these Conservatories I have seen, that were very large and beautiful. There is also Plenty of *Xicames*, of a better Taste than those of *Mexico*. So that we may conclude *California* to be a very fruitful Country. On the Mountains there are all the Year long *Mescales*, a Fruit peculiar to this Country ; and in most Seasons, large Pistachio's of several sorts, and Figs of different Colours. The Trees are very beautiful ; and amongst others, that which the *Chinos* (who are the Natives of the Country) call *Palo Santo*, bears a great deal of Fruit ; from this they draw excellent Frankincense. This Country abounds also in Grain ; of which there are fourteen sorts that the People feed on. They use the Roots of Trees and Plants, and among others, those of the *Tyuca*, to make their Bread of. There are excellent Skirrets ; a sort of red Strawberries, of which they eat plentifully ; and Citrons and Water-Melons of an extraordinary size. The Land is so good, that most Plants bear Fruit three times a Year : So that with some Labour in cultivating it, and Skill in managing the Water, they render the Country extreamly fertile. Nor is there any sort of Fruit or Grain, but what they gather in great Abundance ; which we experienc'd our selves : For bringing with us from *New Spain* Corn, *Indian* Wheat, Pease, Lentils, &c. we sowed them, and had a very plentiful Increase, though we had not any Cattle or proper Instruments to till the Ground.

Besides several sorts of Animals that we knew, which are here in plenty, and are good to eat, as Stags, Hares, Conies and the like ; we found two sorts of Deer, that we knew nothing of : We call them Sheep, because they somewhat resemble ours in make. The first sort is as large as a Calf of one or two Years old : Its Head is much like that of a Stag ; and its Horns, which are very large, like those of a Ram : Its Tail and Hair are speckled, and shorter than a Stags : But its Hoof is large, round, and cleft as an Oxes. I have eaten of these Beasts ; their Flesh is very tender and delicious. The other sort of Sheep, some of which are white, and others black, differ less from ours : They are larger, and have



have a great deal more Wool, which is very good, and easy to be Spun and Wrought. Besides these Animals, that serve for Food, there are Lyons, wild Cats, and many others of the like, as in *New Spain*. We brought to *California* some Cows, and store of small Cattel, as Sheep and Goats; which would have increased very much, had not the Necessity we were once in obliged us to kill the greatest part of them. We likewise brought with us Horses and Colts to stock the Country, and began to breed up Hogs; but as these do a great deal of damage in the Villages, and the Women are afraid of them, we have resolved to extirpate them.

As for Fowls, there are in *California* all that are in *Mexico*, and *New Spain*; as Pidgeons, Turtle-Doves, Larks, Partridges of an exquisite Taste and in great Quantities, Geese, Ducks, and many other sorts both of River and Sea-Fowls. The Sea affords great Plenty of very good Fish: They take Pilchers, Anchovies, and Tunnys; which last they catch with their Hands on the Shore. We often see Whales, and all sorts of Tortoises. The Shoars are fill'd with Heaps of Shells, larger than those of Mother of Pearl. The Salt that they have, is not from the Sea, but out of Pits: It is as bright as Crystal, and so hard that they are often forced to break it with Hammers. It is a very good Commodity in *New Spain*, where Salt is scarce.

*California* has been known near these two Centuries; and its Coasts are famous for the Pearl-Fishery, which has made the *Europeans* so desirous of establishing a Trade here. It is certain, if the King would erect a Fishery here at his own Charge, he might draw great advantage from it. Nor do I doubt but that there are Mines to be found in several places, if they were sought for; since the Country is under the same Degree as the Provinces of *Cinalao* and *Sonora*, where there are very rich ones.

The *Californians* make no esteem of the Plenty and Riches of their Country; contenting themselves with what is only necessary for Life, they take little care for the rest. The Inland Parts of the Country are very populous, especially towards the North: And tho' there is scarce a Town, but what has twenty, thirty, forty, or fifty Families in it, yet they have no Houses; but defend themselves from the Heat of the Sun in the Day time under the Shade of the Trees and of their Leaves and Branches, which make a sort of Roof against the Inclemency of the Night. In the Winter they shut themselves in Caves in the Earth, and live there together little better than like so many Beasts.

The Men go naked; at least all were so, that we saw. They wear about their Head, a fine Linen Fillet, or sort of Network; and about their Neck, and sometimes about their Arms, for Ornament, Mother of Pearl in divers Figures, very finely wrought, and prettily intermix'd with little round Fruits, somewhat like the Beads of a Chaplet. They have no other Arms than Bows and Arrows, and a sort of Javelin, which they  
always



always carry in their Hand, either to kill their Game, or defend themselves from their Enemies; for their Towns often make War upon one another.

The Women are somewhat more modestly cloathed, wearing from their Waste down to their Knees a kind of Apron, made of Reeds very neatly wrought and matted together. They cover their Shoulders with the Skins of Beasts, and wear about their Heads like the Men, a very curious kind of Net-work; which our Soldiers find so convenient, that they make use of them to tie up their Hair with. They, as well as the Men, have Necklaces of Mother of Pearl, mix'd with the Stones of some sorts of Fruit and Sea-shells, hanging down to their Waste; and Bracelets, in like manner of the same.

The common Employment of both Men and Women, is Spinning. They make their Thread of long Plants, which serve them instead of Hemp and Flax; or else of a Cotton-like Substance found in the Shell of some sorts of Fruit. Of the finer sort of Thread, they make the Ornaments above-mentioned, and of the coarser, Fishing-Nets, and Sacks or Bags for several Uses. The Men moreover, (of certain Plants, whose Fibres are very close and thick set, and which they are very well skill'd in working,) imploy themselves in making Dishes, and other Kitchen Necessaries of all Fashions and Sizes. The smaller Pieces serve for drinking Cups; those that are larger for Plates and Dishes, and sometimes for Umbella's for the Women; and the largest sort for Baskets to gather Fruit in, and sometimes for Pans and Basons to dress their Meat in: But they take care to keep them continually moving, while they are over the Fire, for if the Flame catch them they are soon burnt.

The *Californians* have a great deal of Liveliness, and are naturally addicted to Raillery; as we found when we began first to instruct them: For if we committed any Error in their Language, they jested and made Sport at us. But after we were grown better acquainted and more familiar with them, if we committed any Faults, they civilly advised us of them. And if at any time we explained any Mystery, or Point of Morality, not conformable to their Prejudices and Errors, they waited for the Preacher after Sermon, and disputed against him with a great deal of Force and Wit: If we could give them good Reasons for it, they listen'd very attentively; and when at last convinced, submitted, and did accordingly. We have not found among them any Form of Government, Religion, or regular Worship. They adore the Moon, and cut their Hair, (as I remember) in her Decrease, in honour of their Deity; which they give to their Priests, who imploy it to several superstitious Uses. Every Family makes Laws as they please, which is plainly the reason that they are so often at War with one another.



## XVI. Papers omitted.

1. Animadversiones quædam in Codicem MS. membranaceum in Bibliotheca D. Laurentii Florentiæ: excerptæ ex Additamentis G. Ch. Schellhammeri in Herm. Coringii Introductionem in Artem Medicam. cap. xii. p. 401. n. 334. p. 459.
2. A Relation of the New Island thrown up near the Island of Santorini; sent to the Marquis of Ferriol, Ambassador Extraordinary of France, at the Ottoman Port. Taken from the Mem. Hist. Acad. Sc. at Trevoux for July, 1708. Most of the material Particulars here mention'd being inserted in Father Goree's Account. n. 317. p. 200.

## XVII. Accounts of Books omitted.

1. A Voyage to the Islands of Madera, Barbadoes, Nevis, St. Christophers, and Jamaica: with the Natural History of Jamaica, by Sir Hans Sloane, Baronet. n. 311. p. 2433.
2. 'Ουρεσιφοίτης Helveticus: five Itinera Alpina tria, &c. Authore Joh. Jac. Scheuchzero, M. D. Lond. 1708. n. 316. p. 143.
3. Archæologia Britannica; giving some Account additional to what has hitherto been publish'd of the Languages, Histories, and Customs of the original Inhabitants of Great Britain; From Collections and Observations in Travels thro' Wales, Cornwall, Bas Bretagne, Ireland, and Scotland: by Edward Lhwyd, M. A. of Jesus College, and Keeper of the Ashmolean Museum in Oxford, Oxon. 1707. n. 311. p. 2438.

## C H A P. III.

## Miscellaneous Papers.

Y Esterday I had at Rotterdam, a young Lad of seventeen Years old, that can neither write nor read, that out of his Head will reckon any the most difficult Sums you can give him, even to the utmost Fractions. I gave him an average to make of a Ship run ashore; to save Ship and Goods were worth 13679,14. the Charges on the Salvage was 2931,16. I ask'd him how much that was *per Cent.* he told me, after a little talking to himself, that it was 21 gild. 9 st. and a small Fraction, and so it is. I ask'd him what 4943,3, 2848,4, 2244,7, 2194,7, 544,19, 351,18, and 52,16 must pay respectively, he told me exactly to so many Stivers and  $\frac{270}{1000}$ . I ask'd him how he came by that Knowledge, he

I.  
One that could  
neither write  
nor read, yet  
cast up Sums to  
great exact-  
ness, by Mr.  
Locke, n. 272.  
p. 893.



he said by selling Sea Snails (*Alykreucken*) and Muscles, for he receiv'd nothing but doits, and so he brought his Father home so many doits, but could never tell how much Money they amounted to, till he ask'd his Father how many doits made a gilder, and being 160, then he reckon'd how many in 10 and 100, and so from one thing to another, he has a Table of Multiplication in his Head of half a Yard long or more: I try'd him by a Table I have, and he answer'd me as readily as you can upon the ordinary Table of Multiplication. He wanders from Town to Town to see who has any thing to Cypher, and so gets some Money; but would fain learn to read and write. This I mention because it is so prodigious; and he divides almost with as much ease as he multiplies, and reduces things to the least Denomination in Fractions. I have a great Mind, could I be assured of his Fidelity, to take him into my House, and learn him to read, write and cypher.

Two Deaf  
Persons, who  
can speak and  
understand  
what is said  
to them by the  
Motion of the  
Lips, by Rich.  
Waller, Esq;  
n.312.p.2468.

II. There live now a Man and his Sister, each about fifty Years old, neither of which have the least Sense of Hearing; they both live by their daily Labour, yet both these Persons know by the Motion of the Lips only, whatever is said to them, and will answer pertinently to the Question proposed to them of any thing within their Capacity, and are both very intelligent, as far as can be expected from their Education. I remember several Years since, when this Man was working in the Garden, Mr. Colson and I standing together, I took an Opportunity when the Fellow look'd on me, to ask him some Question or other, which he readily understood, and answer'd according to it; tho' Mr. Colson that stood by me heard me say nothing, the Fellow understanding it only by the Motion of the Mouth, so that you need only whisper, provided the Lips and Mouth be but moved as they ought, and you do not speak too fast. I many Years since inquired of his Mother, who has been long dead, as to their Deafness; and she told me, they could hear very well and speak when they were Children, but both lost that Sense afterwards, which makes them retain their Speech: Tho' that, to Persons not used to them is a little uncouth and odd, but intelligible enough, especially the Man's. They were not Twins; and I knew two Brothers of the same Parents that had their Hearing as well as any Persons whatever.

Of the Inven-  
tion of Print-  
ing by ———  
n.288.p.1507.  
v. sup. p. 153.

III. 1. That Books were printed at *Haerlem* by *Coster* in 1430, and 1432 appearing from Copies of that \* date there extant; and this agreeing so well with the Account given by *Theodore Schrevelius* and others, leaves us little or no room to doubt, whether the Honour of the Invention be due to *this* or the other Cities, whose Writers have so eagerly contended for it; since none of them have pretended to shew any Book printed near that time. But the Difficulty lies, either in shewing why the Practice of this Art should be at a stand from *A. D.* 1432, to the noted Re-  
viving



viving of it at *Mentz*, by *John Fust* and *Peter Schoeffer*, who (as it has been vulgarly, but erroneously said) did print the first printed Book there *A. D.* 1465, namely, *Tully's Offices*: or else, in giving any tolerable Account of the Progress of this Invention during an Interval of above thirty Years.

*Boxhornius* (as I remember) as well as *Schrevelius* and other Authors, do expressly say, (and if they had not, it might well be imagin'd) that *Coster* could not advance this Invention so far, as to print so large a Work as the *Speculum Salutis* without gradual Improvements; and that his first Essays were on loose and small *leaves* of Paper, before he attempted *whole Books*. These being loose and single, are suppos'd to be all lost: but I once observ'd a loose leaf of Paper in *Octavo*, lying in an old MS. *Breviary* in her Majesty's Royal Library at *St. James's*, which I then thought (and am still in the same Opinion) that 'twas one of *Coster's* first Pieces; done when he had attain'd to some Experience in the Art, and to get Money. 'Tis a little rude Wooden Cut, of the five Wounds of our Blessed Saviour, and the Instruments of his Passion, with a *Latin* Inscription at the Bottom, to this Purport, that Those who should say so many *Ave Maria's* before it, should have so many thousand Years of Pardon. In this Cut or Print, the Ink which made it was *Writing Ink*, and 'twas all Black, without those other Colours with which *Coster* seems afterwards to have adorn'd his Books. \* *Boxhornius* says that *Hadrianus Junius* had a Book Printed by *Coster*, and like that kept in the Chest at *Haerlem*: Now amongst those bequeath'd to the *Bodleian Library* at *Oxford*, by Mr. *Francis Junius* (who was a Kinsman of *Hadrian's*) there is a thin Book in a small Folio (Numbred 31.) which may probably be the same; and which Mr. *Foss*, a learned and curious *Danish* Gentleman, did assure me was very like to that at *Haerlem*. This contains the Sum of the *History of the Old Testament*, all represented in rude Wooden Cuts, coloured with divers Colours, without *Shadows* like to our *Cards*, (which, with *Sheet-Ballads*, are Remains of the old manner of Printing,) and Stamp'd upon one Side only; the white Sides of two Leaves being pasted together; the Black, both in the *Pictures* and *Inscriptions*, which shew the meaning of them, being † *Writing Ink*, (as the aforesaid Leaf) inartificially spread upon the Wooden Block; here thick, there thin; spreading and yellowish; the Letters extreamly rude, and all together manifestly shewing that the Art was yet in its Infancy. The Stamping of this Book on one Side only, was not (as some think) because the *Printer* did not know how to dispose the Pages in such manner, as might be proper and easy for the *Book-Binder's* Use; for it has its

\* *De Origine Artis Typographicæ.*

† Chap. II. p. 34 It is to be wish'd that Mr. \* Ellis, when he had *Coster's* Books in his Hands, had observ'd whether the Black Ink, was Printing Ink or not; whether *Coster's* Picture was ancient and colour'd, or not; or if there were more in either of the Books; whether the whole was Cut upon Wood, or Compos'd with Printing Letter; whether there were Signatures for the Book-Binders, &c.

\* v. supra p. 153.



*Signatures* all along in *Minuscule Letters*, (set in the Middle of the Page, which is remarkable;) but because it was thought that the Paper would not bear a second Impression on the back Side; just as the *Book-Writers* of those times (when Paper began to be cheap, and to be made up into Books) would yet have the first and last Leaf of each *Quaternio*, *Senio*, &c. to be of *Parchment* for Strength's sake. This Book (as I remember) is imperfect, and has no *Date* now appearing, and perhaps never had any; neither has such another Book as this, which contains the *History of St. John and the Apocalypse*, in such like wooden coloured Pictures and Inscriptions. This is inscribed *L A U D. E. 65.* in the same *Bodleian Library*, and has its *Signatures* also in *Majuscule Letters* (as indeed I have observed *Signatures* in many MSS. of different Ages, as high as 1000 Years ago and upwards, expressed either by *Letters* or *Numbers*.) This Book, though Printed on one Side, and Pasted as the former, is yet more elegant, and shews that the Art was much improved. And here it may not be impertinent to observe, that in the same \* Library is an ancient MSS. with the same *Figures* and *Inscriptions*, though the *Habits* of the Figures be different, those of the MS. being of the older Fashion, and 'tis very likely that there is another Copy of this Book in the *Emperors Library* at *Vienna*; for † *Lambecius* reckons amongst those which he brought away from the *Archi-ducal Library* at *Inspruck*, a Book of which he gives this Account, *Apocalypsis S. Joannis Apostoli & Evangelistæ Latino-Germanica, chartacea in folio, una cum Vita ipsius, & multis figuris ligno incisis, quæ propter vetustatem suam spectatu sunt dignissimæ*, and in this Book at *Oxford*, besides the Printed Cuts, also a *Commentary* upon the *Apocalypse* in *High-Dutch*. Besides these two most ancient Printed Books, Mr. *Bagford*, in the *Manuscript Library* of *Corpus Christi College* in *Cambridge* saw a third, containing the *History of our Saviour*, Printed on one Side only of the Paper, with such like *Wooden Cuts*; but yet more neatly than either of the former, which I had before shewn him at *Oxford*. And these three Books, being as is before said, Stamp'd but on one side of the Leaf; the whole wrought or cut upon *Wood*; not *Set* or *Composed* with *Printing Letter*; and Printed with *Writing Ink*; do sufficiently demonstrate that the Art was as yet in its Infancy; and may, though they bear no Workman's Name, be very reasonably ascribed to *Coster*, not only because no Body else lays claim to them, but because in divers Circumstances they agree with the History of the Man, and with what remains of his Workmanship. If it be asked why *Coster* did not set his Name, and the Year to these Books, as well as to that at *Harlem*, mentioned by Mr. *Ellis*? It may be answer'd, that *Schrevelius* tell us that *Coster* bound *Fust* above-mentioned, by Oath to Secrecy, and not to betray the Art to any Person whatsoever. Wherein 'tis likely, that his Design was not so much to let the World think, that he had a new Way of multiplying the Copy of a Book much quicker than the quickest Penman; but that he designed to impose upon the World, by selling his *Printed Books*, for *New-Written Copies*, whereby the *Book-Writer* and

\* *Arch. B.*  
*Bodl. 88.*

† *Comment.*  
*de Biblioth.*  
*Cæs. lib. II.*  
*p. 772.*

*Illumi-*



*Illuminator* must (as he might well pretend) be so paid for their Work, as to maintain themselves and Families. This Trick might be long undiscovered in or about *Harlem*; because there was no other Printing, whereby this might be condemn'd; but at length, as *Boxhornius* and *Schrevelius* write, *Fust* ran away with all his Master's Tools and Materials, and in Process of time set up a Printer's Shop at *Mentz*, being assisted by his Servant *Peter Schoeffer* (a Young Man of a good Genius) who afterwards married his Daughter, and became his Partner in the Business. The Story goes, that this *John Fust* went to *Paris* (but whether before or after his settling at *Mentz*, I cannot tell :) and that he there offer'd a great Number of *Printed Bibles* to sale, as if they were *Manuscripts*. But the *French* were not to be so caught. They considered the Number of these Books, and their exact Conformity to one another throughout the whole, to a Line, a Word, a Letter, a Point, and that the best of *Book-Writers* could not be thus exact, and therefore by indicting of *Diabolical Magick* (or threatening him with it) they at once gave Birth to the Story of *Dr. Faustus*, and caused him to discover the Art. And I doubt not but about this time, very many Books were printed and sold for Manuscripts, I having seen divers such Books without Dates, which look'd rather older than any I have seen with them. I speak now of those that are Set or Compos'd of *Letter*, which with *Printing-Ink* of Lamp-Black and Oyl, and the *Printing-Press*, is said to be the Improvement of *Schoeffer* above-mentioned; though *Schrevelius*, with less Reason, ascribes the two former to his Countryman *Coster*.

When *Fust* and *Schoeffer* began first to Work at *Mentz* is uncertain, but the first mention that I find of him, as a Printer at *Mentz*, is in *Schrevelius*, *Harlem*, pag. 272. where he says that this *Fust* (or *Faustus* as he calls him) published *Alexandri Doctrinale cum Petri Hispani tractatibus*, A. D. 1442. but this and some other Books mentioned by Writers on this Subject, are never said to be extant in any particular Place, in order to be consulted upon Occasion; and therefore their *Titles* and *Dates* are not so much to be relied upon. But another Date, which though not so Old, is more *Authentick*, may be found in the above-cited Book of \* *Lambe-* p. 989: *cius*, where he says he brought away from *Inspruck*, amongst other choice Volumes, and placed in the *Imperial Library* at *Vienna*, a *Psalter* Printed upon *Parchment*, with this Inscription at the End, *Præsens Psalmodum codex venustate Capitalium decoratus, Rubricationibusque sufficienter distinctus, ad inventionem artificiosam imprimendi ac characterizandi, absque calami ulla exaratione sic effigiatus, & ad eusebiam Dei industrie est consummatus per Johannem Fust, Civem Moguntinum, & Petrum Schoeffer de Gernszheim, anno Domini millesimo CCCCLVII. in Vigilia Assumptionis*. From this time there are constant Remains of the Industry of these Men, and I can mention more Books Printed by them, than the *Durandus* (in the Library of *Basil* in *Switzerland*) Printed (as a Gentleman who saw it told me) A. D. 1458. *Joannes Joannensis's Catholicon* (in her Majesty's and the



Lord Bishop of Norwich's Libraries,) Printed 1460. The *Latin Bible* of 1462, yet extant in the *French King's Library*, and in divers *Monasteries*; beyond the Seas, and perhaps in *England*. The *Tully's Offices* Printed both in 1465, and 1466, (if both these be not the same Edition, the *last Sheet* or *Leaf* being compos'd afresh :) and so on till *Schoeffer* work'd for himself after the Death of *Fust*, and *Schoeffer's* Posterity after him. But I willingly forbear the Catalogue, in hopes that this, with that of the other *old Printers* throughout *Europe*, and especially of our *English Workmen*, with their *Devices*, the *Effigies* of most of them, and a Multitude of uncommon Remarks relating to *Writing*, *Printing*, *Parchment*, *Paper*, *Binding*, &c. will be communicated to the World, when *Mr. Bagford's* Papers shall be digested.

Upon the first Discovery of the Art by *Fust* at *Paris*, or at his first Settlement or publick Profession of it at *Mentz*, it quickly spread over the best Parts of *Europe*, \* and was commonly used in other Countries before 'twas known in *England* (notwithstanding what some Writers do affirm to the contrary;) the first Book that we pretend to have been Printed here, being *Hierome* (or rather *Rufinus*) on the *Creed*, Printed at *Oxford*; *A. D.* 1468. To prove this in some measure (not to mention the Progress of *Printing* in other Countries) I instance in *Italy*, and particularly *Rome*. Here, not to insist on the large Catalogue of *Printed Books* described in an Epistle to Pope *Xystus IV.* Published at the Beginning of the *V. Tome* of the *Bible* Printed with *Lyra's Commentaries* at *Rome*, *A. D.* 1472, and transcribed by *Boxhornius*; I shall only relate the Sum of what I meet with in *Bernard Mountfaucon's Diarium Italicum*, *Tom. i. page 255, 256.* 'Tis that *Joannes Aleriensis*, in a flattering Epistle to Pope *Paul II.* (who was elected *A. D.* 1464.) congratulates him, because *Printing* was first us'd at *Rome*, under his Pontificat. Which if, spoken of the very first Practice of the Art at *Rome*, and not of an established Imprimery, seems to be false, because this learned Monk, in the same Place, says he saw a *Lactantius* in the *Museum* (or Study) of *Monsieur de la Thuilliere*, which has these Words at the End, *Lactantii Firmiani Institutiones cuse in venerabili Manasterio Sublacensi anno 1461. antepenultima Octobris.* Now unless a Man will suppose *Printing* to be invented in this Monastery, he must believe it to be brought hither from *Rome*, which is but about twenty Miles distant from it. And the same Author says, that *Floravantes Martinellus* in his *Roma Sacra*, affirms that *Printing* was practised at *Rome* in the Palace of the *Maximi*, *A. D.* 1455, under Pope *Nicolaus V.* by *Conrad Sweynheim* and *Arnold Pannartz*, who were both *Germans*, and continued *Printers* there for many Years after.

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\* From these Places, and from Books or Part of Books, where, or wherein such sorts of Letter was used, the Printers do still call their Letter, *Italick*, *Roman*, *English*, &c. *Austin*, *Canon*, *Pica*, *Primer*, *Brevier*, &c.



The Custom of putting the *Dates of Printed Books* at the *End* of them, was taken up in Imitation of divers the middle-aged and recenter Manuscripts (for I never saw or heard of any ancient Manuscript in *Capital Letters*, either *Greek* or *Latin*, which has a *profess'd Date* written in the *first hand*;) but here the Inspector ought to be cautious, lest he be led into an Error: For several Manuscripts at the End have a Date, which may be by some understood of the time when those individual Copies were written, when as they only notify the time when the *Author finish'd his Work*. And some of these Dates, being Printed from the Manuscripts, have deceived many curious Men. For Example, the first Edition of *Lyndwood, Paulus à Sancta Maria*, and others which I could name. Besides, some Dates in ancient Printed Books, being not corrected, are false; such as a Book Printed in the Beginning of the 16<sup>th</sup> Century, in the Library belonging to the *Ashmolean Museum* at *Oxford*, which thus pretends to 400 or 500 Years of Age. A *Julius Hyginus* once shewed to me by Mr. Millington the Bookseller, Printed at *Paris* (as there put down) *An. Dom. MCCCCXII.* instead of *MCCCCCXII.* For the Printer is mention'd as then living in *l' Origine de l' Imprimerie de Paris*. I have indeed a Book wherein, amongst other Tracts, is one of an old Print, at the End of which there seems to be such a Mistake, though not so easily rectified as the former. The words are these, *Explicit opusculum Enee Sylvii de duobus amantibus in Civitate Leydenfi Anno Domini Millesimo CCCC quadragesimo tertio L E I E N.* Now though *Leyden* seems to be the Place where 'twas Printed, yet 1443 cannot be the time when; for just before *Sylvius* says himself, *Vale, ex Vienna quinto Nonas Julias Mo CCCC quadragesimo quarto.* *Sylvius* was elected Pope by the Name of *Pius I.* *A. D.* 1458, and died *A. D.* 1464. Now it may seem probable, that if this Tract was Printed after his Election (as suppose *A. D.* 1463.) or even after his Decease, his Papal Dignity might have been remembred; If it be judg'd to have been Printed before his Election, I know none that will allow of Printing at *Leyden*, (or even in *Lyons*) so very early.

One Objection may be urg'd against what is said of *Koster's* or the old Printed Books above-mentioned, being Printed upon Paper about *A. D.* 1430, or soon after. For some Authors are of Opinion, that Paper made of Linen Rags was first made at *Basil*, by some *Greeks* who fled out of their Country after the Sackage of *Constantinople*, *A. D.* 1452. in Imitation of the *Cotton Paper*, commonly used in the *Levant*. But this can have no force, our Paper being much older: For I have a Piece, the Writing upon which seems to be about 350 Years old, and agrees very well with a Charter which I have seen of *Thomas Beauchamp* Earl of *Warwick*, bearing Date *A. D.* 1358. and 32 *Edw. III.* In the Archives of the Library belonging to the R.R. Dean and Chapter of *Canterbury*, I saw an Inventory of the Goods of *Henry* Prior of *Christs Church* there, taken upon his Decease, (as I remember) the 20<sup>th</sup> Year of *K. Edward III.* and this is written upon *Paper*. In the *Cottonian* Library, though searching after



after other Matters, I could not but observe several Writings upon our *Paper*, in the time of most of our Kings and Queens, as high as the 15<sup>th</sup> of King *Edward III.* and I doubt not but that there are others more ancient in the same place. But in the *East*, the use of *Cotton Paper* is much more ancient, and I have in the *Bodleian Library* seen an *Arabick Manuscript* (amongst those which the University bought of Dr. *Huntingdon*) written in the 427<sup>th</sup> of the Year *Hegira*, i. e. *A. D.* 1049, and others in the same place, without dates, seem older.

Tho' the Invention of the *Rolling-Press* is commonly ascribed to *Lipsius*; yet it seems older than his Time, from a printed Book in the *Bodleian Library*, placed *LAVD. D.* 138. This is a *Missale secundum usum Ecclesiae Herbipolensis* (i. e. *Wurtzburg* in Germany.) *Rodolfus* Archbishop of that Church sets forth in an Instrument at the beginning of the Book, the Reasons why he caused this Missal to be published, which Instrument bears date the 8<sup>th</sup> of *November* 1481, by which time he orders all the Copies to be finished by *Jorius Ryser* his Printer, who seems to have done so, since his Name, and this Year 1481, is written at the end of the Book. Instead of a Seal to this Instrument is an *Engraven Print*, being the *Arms* of the *See* supported by two Angels, and *St. Kilian* (its first Bishop and Protector) behind; as also this Prelate's own Arms with those of the *See* in another *Escutcheon*, and a very fine *Mantling*. This is extremely well engraven for the time, and equals the Performances of some of our best Workmen at present. The evident Marks of *Pressure* by the *Plate*, with some touch of *Ink* at the *Edges*, the *Roughness* of the Print, and other Circumstances concurring, I thought this must needs be wrought off at the *Rolling-Press*. I shewed it to divers very knowing and curious Gentlemen, to several *Printers*, *Engravers*, and others working constantly at the *Rolling-Press*, who all concurr'd (tho' at different times, one not knowing what another had said) that 'twas not only excellently well engraven (and this before *Albert Durer's* Time) but that it was certainly pull'd from the *Rolling-Press*, and could be done no other way. And that this Print was not done after that time, appears from several Notes written here and there in the Book. One of them specifies that *William Kewsh*, Vicar of *St. Bartholomew's Church* in *Wurtzburg*, bought this Book the same Year 1481, paying eighteen *Florins* for the *Parchment*, *Printing*, *Rubrication*, *Illumination* and *Binding*. By another it appears, that he gave it to the Church for ever. And by some others it appears that it remained there during the times of his several Successors, till the last Age, when, as I suppose, the *Swedes*, under *Gustavus Adolphus*, plunder'd the Church, and brought it out.

—by Mr.  
Bagford. m.  
310. p. 2397.

2. The general Notion of most Authors is, that we had the hint of Printing from the *Chineses*; but I am not in the least inclin'd to be of that Opinion, for at that time of Day we had no knowledge of them. I think we might more probably take it from the ancient *Romans*, their Medals, Seals, and the Marks or Names at the bottom of their sacrific-



cing Pots, which Antiquities we had amongst our selves in *Europe*, rather than fetch it so far. But if it be certain, that Cards are as old as our King *Henry VI.* nothing that I have seen or considered of, seems to give so fair an hint for Printing, as the making of Cards; as is evident by the first Specimen of Printing at *Harlem*, and by some Books in the *Bodleian Library* at *Oxford*, one in *Junius's* Collection, another in Archbishop *Laud's*, and a third in the same, being the Lives of the *Russian* Saints in a thin Folio; the Leaves are not pasted together as the former two, but cut on wooden Blocks, and illuminated. There is also another rare Specimen of the first in that valuable Collection of Archbishop *Parker*, in *Bennet College Library* at *Cambridge*, bound up with a MS. Book; this was shewn me at first by Mr. *Bullord*, and differs very much from them at *Oxford*; it is the *Life of Christ* in Figures, or rather the Types of the Old and New Testament. They have not so many Specimens of the first Printing at *Harlem*, as we have in *England*. I am apt to believe, that if some curious Persons had the Liberty of looking over the Libraries in both Universities, and that in *Gresham College*, there might be found other Specimens of the ancient Printing; the aforementioned Books being taken notice of but of late.

The cutting of the Molds or Blocks for making our playing Cards, is after the same manner as those for the Books printed at *Harlem*. They lay a Sheet of moist or wet Paper on the Form or Block, being first lightly brush'd over with Ink, made of Lamp-black mix'd with Starch and Water: Then they rub it off with a round List with their Hand, which is done with great Expedition; this is for Picture or Court Cards: Then they paste them together threefold, the coarsest in the middle. They colour them by the help of several *Patterns* or *Stanesfiles*, as they call them; they are Card Paper cut thro' with a Penknife, for every Colour, as red, &c. (for at the first Printing, the Card has only a mere Out-Line:) These *Patterns* are painted with Oyl-colours, to keep them from wearing out with the Brushes; they lay it upon the Picture, and by sliding a Brush that is full and loose gently over the Pattern, it fixes the Colour into the cut Holes, and leaves it on the Print that is to be a Card, and so go through all the Colours you see on Cards; but this cannot be so well understood by a Description, as by seeing them perform it. This I humbly conceive to be their way of Printing first at *Harlem*, and those Books above mention'd. This methinks might have been considered before this time of Day, if they would have put themselves to the trouble of inspecting the old MSS. nine hundred Years old; for the great Letters are done by the Illuminators the same way as Card-making; as I shall treat of more at large in another Dissertation.

The next Form of Printing at *Harlem*, was by cutting whole Forms in Wood from MSS. exactly written, and without Pictures: Such I take the *Donatus* to be mentioned in Histories; and this might bear date in 1450, some say 1440. This may be as plainly demonstrated, as the former,



mer, from Copy-Books which we have seen printed at *Rome, Venice, Switzerland* and *England*, as high as 1500; and, if I mistake not, there is a Block cut in Box in the Collection of your *Museum* in *Gresham-College*. This writing is harder to perform than either the *Roman, Italick*, or any other Letter used in printed Books.

The third way of Printing was with single Types made of Wood, but to whom the Honour of the Invention is due, is not very evident; it was then esteemed so great a Rarity, that the Printers carry'd their Letters in Bags at their Backs, and got Money at great Mens Houses by Printing the Names of the Family, Epitaphs, Songs, and other small Pamphlets.

The fourth Improvement of this Noble Art was the Invention of single Types made of Metal. Here we must intirely give the Honour to the never to be forgotten *Peter Scheffer* of *Grenschen*, Servant and afterwards Son-in-Law to *Faust*, who entertain'd him to work in his House at *Mentz*: He observing how industrious his Master was every Day to improve this Art, undertook it himself; and with much Study and Industry, brought it to perfection. After he had made several Essays, at last he shews it to his Master *Faust*, who having try'd some Experiments with his new-invented single Types, finding that it would answer his Expectation, was so transported with Joy, that for his Reward, he promis'd he should marry his Daughter, a very beautiful Damsel, whose Name was *Christian*, which sometime after he performed, and continu'd together improving this Art with great Secrecy, till it became known, and spread it self over all *Europe*. Sometimes you have their Names to the Books they printed at the end, and sometimes not; sometimes with Dates as high as the Year 1457, as the *Psalms* printed by them, now in the Emperor's Library, which *Lambecius* mentions in his *Bibliotheca*, and as low as the Year 1490; and for this we have the Authority of *Erasmus*, in a Preface to *Livy*, printed at *Basil* by *Froben*, in 15... As for *John Guttemburgh*, tho' by abundance of Authors he is said to be the first Inventor of Printing, we cannot find one Book with his Name and Printing; but this requires a longer Consideration, which in its due place I shall take notice of. We may rationally conjecture, that printing with Plates of Pewter, Brass, or Iron, either grav'd or eat with *Aqua fortis*, was first practis'd by the working Goldsmiths; for they have a way of taking off the Impressions of their Work, by the Smoak of a Lamp, which, perhaps, gave the hint to the graving on Brass.

Having treated of Printing to satisfy the curious, I shall say something of the several Advances and Improvements it hath received. The *Harlem* Printing at first was a Book with Pictures; they took off the Impression with a Lift coiled up, as the Card-makers use the same to this day. But when they came to use single Types, they made use of stronger Paper, with Vellum and Parchment: Then they made use of a Press, altho'



altho' they afterwards contrived and made it more useful, as I shall treat of in another place. Neither was their Ink for Printing brought to Perfection at the first, but improved by degrees. Rowling-Prefs Printing was not used in *England* till King *James I.* and then brought from *Antwerp* by our industrious *John Speed*. I shall also discourse at large of the Invention of making Paper in *Europe* from all the best Authors, with large Observations of my own; the time when it began in several Places, more especially in *England*; and I intend to exhibit a Specimen of the Marks of the old Paper, which has not yet been attempted by any.

Book-binding shall be handled in all its Parts, its several Ages and Times: Also the Form, Size and Volume, Folding, Sewing, Headbanding, several sorts of Boards for Covers, Claspings, Bosting, &c. Also in all Countries, as *China*, *Persia*, *Turkey*, *Greece*, Ancient and Modern *Germany*, *Italy*, *France*, *Holland* and *Spain*; but more particularly *England*. The Devices, *Rebus's*, and Signs of the ancient Printers will take up a whole Chapter, where their Descent and Genealogies shall be shewn, and how they succeeded one another in their Office, or Printing-House. On this Subject I have no Path to follow; but *Draudeus* hath a Tract I find mentioned, that treats of the ancient Devices of the Printers, but after my Inquiry, I could never see it, and so can receive no Assistance from it. Also *Nau-deus's* Life of *Lewis XI.* hath an Account of *Faust's* printing the Bible in the *Latin* Tongue, his bringing them to *Paris*, and vending them there for MSS. his Troubles and Accusations before the Parliament, being try'd for a Conjuror.

Since my second Voyage to *Holland*, to satisfy my Curiosity and remove some Scruples about the Book at *Harlem*, and the Statue of *Coster*, having recollected my self after my first Voyage, and discoursing with Mr. *Talman Jun.* about *Holland* and the Statue of *Coster*; he told me he had seen the same in *Holland*, and that it was in the *Harlemarstreet* in *Leyden*. This very much run in my Mind, to be further satisfied that it should be in *Leyden* and not *Harlem*, altho' asserted by several of our modern Travellers.

At my last being in *Holland*, for my further Satisfaction, tho' I had got Mr. *Ball* to take the Inscription for me the Year before, in *June* 1705, in the Company of *Walter Clavel, Esq;* on *Wednesday* the 23<sup>d</sup> of *October* 1706, we took Boat for *Leyden*, where we arriv'd about six the same Day; and next Day in the Morning, in the Company of Mr. *Bovell*, a Student there, who was our Guide into the *Harlemar-street*, so called because it leadeth to the *Harlem* Parts, over the Door of a Glazier's House was the Figure of *Coster* cut in Wood, and painted with the Inscription. This Statue was not set up by any publick Authority of the Magistrates of that City, but by a private Man; and, if I mistake not, by the Owner of the House, perhaps for the name and sake of the Street; and, as I suppose, not older than about 1630. This Statue is done after the graved Print that is in the Book at *Harlem*, or



the Painting over the Door of *Laurence Johnson Coster*, where they say he first practis'd the *Art of Printing*; but I rather take it, that he liv'd in this House in his old Age, and was Church-Keeper, or as we call it, *Sexton*; for so the Word signifies both in the *German* and *Dutch* Language. This afforded me some Satisfaction.

Some Days leaving *Leyden*, in Company of my Friends, Mr. *John Bullord*, and Mr. *John Murray*, we set forth from *Amsterdam* in a Waggon for *Harlem*, to compare and collate the Book which Mr. *Bullord* had procured for me with that at *Harlem*, it being another Impression in *Quarto*. The Name of the Book at the latter End runs thus: *This Book was finished in the good City of Culenburgh, by me John Veldener, in the Year of our Lord 1483, on the Saturday after St. Matthew's Day*; with the Device of the Printer hanging on the Bough or Snag of a Tree, a Custom they much used in those Days, as may be seen by the Monuments of the Ancients cut on Grave-Stones, not only in the Great Church at *Harlem*, but in several other Cities in *Holland*: The Title of the Book in *Low Dutch*, the Language in which it is Printed, is, *De Spiegel onser Behondenise*. In *English*, *The Mirror of our Salvation*.

When we arrived at *Harlem*, much to my Surprise, we found the House of *Coster* new faced with Plaster, and the Picture of his Statue, (for it is no other than a Picture in Oyl-Colours) painted on a Board let into the Wall near the Top of the House, although it be a small one. This House was new repaired, and to be let, although when I was there before, it was inhabited by a Cheesemonger. After viewing the House and the great Church, we directed our Way to the Rector, who is the School-master, put in by the Magistrates of the City. He not being in the way, his Servant Maid took the Key, and readily gave us Admission into the Prince's Garden, in order to shew us the Book, which was remov'd from the Stair-head of the Prince's *Houffe*, or House, where we saw it last, to the further End of the Garden, in a little House fitted up for that Purpose, facing the Garden. On the Chest that it was kept in there was the Date 1618, inlaid in the Wood. Opening it the Maid shewed us the Book, where Mr. *Bullord* collated it with the other we brought with us from *Amsterdam*, and found it to agree both in the Words of the Text, and also the Pictures; they only differed in this, that being in Folio, with two Pictures in a Page, and the Words Column-wise, and twenty five Lines in a Column, containing sixty Pages, and printed but on one Side, and not pasted together as those at *Oxford* and *Cambridge*. This will enable me to oblige the Curious with a Specimen of the *Harlem* Book, as well as those of *Oxford* and *Cambridge*, the latter I have cut for my History of Printing, as I do intend the others.

At the Entrance into the Garden, at the upper End of the Summer-House, on the Right Hand, we saw the Statue of *Coster*, leaning with its Left Hand on the Inscription, which bore Date 1440; and in its Right Hand the Letter A in a Square, with other Figures, as little Boys naked,



and in their Hands A B C, with the Picture of *Fame* holding the Letters C D and E. This was taken from the Story of *Junius* in his *History of the Low Countries*, and others from him. The Statue of *Coster* is painted in Distemper, and is no older (as appears by the Date on the Cieling) than 1655.

As *Printing* it self is but another Way of Writing, and brought to Perfection by Degrees, as other Arts; and as Pictures either painted, cut in Wood, or Graved, were called the Laymens Books; for every one could read a Picture, and say this is an House, and that a Tree; so I may say, that the Pictures, or Drawings of the Ancients, gave the first Hint of *Printing*; and if the Scribes, in Process of time, had not brought their *Art of Writing* into the Decorum and Uniformity, and Rule in their several Volumes, the *Printers* could not have followed them so exactly in the Imitation of their Letters and Pages of their Books. Pictures first were those of Devotion; then the making of Cards was another Introduction to the Invention of *Printing*: The making of Cards I take to be very ancient. For the first Specimen of *Printing*, was on one Side only, as that at *Bennet-College*, most in Figures, with some few Words only on the Side in Labels like that at *Oxford*. The next Step is that Book at *Harlem*; the Design of the Prints are better perform'd, and then they came to have not only Lines, but whole Pages of Words, besides the Pictures on a Page. The next Step was *Ballad-Printing* with the like Pictures, and them but on one Side. The next Improvement of this noble Art, was the cutting of whole Pages on wooden Blocks or Moulds, and Printing on both Sides of the Page; and the first Specimen of this Nature was a *Donatus*, and, as Authors say, was printed at *Harlem* and at *Mentz*, although some say a Bible was printed the same way 1457.

I shall moreover give the Marks of the ancient Paper from the 12<sup>th</sup> Century down to 1600, in the several Countries where the *Paper-makers* lived. The Specimens of ancient Pieces of MSS. and also of ancient Paper, collected by my self some Years since, and bound up in two Volumes in large Folio, are now to be seen in the Library of his Grace the Archbishop of *Canterbury*, in *St. Martin's*, collected and put together at no small Cost and Pains; perhaps the first of that kind that ever was done in any Part of *Europe*. I conclude with informing you, that in this Treatise I shall give an Historical Account of the several Versions and Impressions of the *Holy Bible*, *Testament*, *Psalms*, *Primer*, and other Books of Devotion, from the Beginning of the *Reformation* down to 1600. Some Collections coming into my Hands of late, wherein I find several material Passages not mentioned by any that have gone before me, I shall treat of them in a distinct Chapter.

3. His Collection consists chiefly of *Title-Pages* and other *Fragments* put together into Books, many of them in some sort of Order and Method, and others not. *Ex. gr.*

*His Collections by Mr. Wanley, ib.*

In one Volume there are Specimens of *Letters* of all sorts, as well of those used in foreign Countries, as in *England*. In another are Titles and Fragments of *Almanacks* from *A. D.* 1537. downwards; with Titles of

*p. 2407.*



*Bibles, Law-Books, &c.* Printed by the *Company of Stationers* in *London*. In other Volumes are the *Titles of Books* of all kinds, printed by the *London-Printers*, disposed into some sort of Order, viz. as to the Subject of the Book, or Dwelling-place of the *Printer*. In others are *Title-pages of Books* printed in *Oxford* and *Cambridge*. In others, *Title-pages* of those printed in *Scotland* and *Ireland*. *Title-pages* and *Frontispieces*, with other *Specimens* of the Works of our *English Engravers*. *Titles of Books* printed by *Roman Catholicks, Presbyterians, Quakers*, by other *Sectaries*, by *Seditious Persons*, &c.

*Cuts of Monuments, Tombs, Funerals, &c.* in *England*. *Cuts* of the same in *Foreign Parts*, with the *Cuts* of the manner of *Executing Criminals*. *Cuts* with some *Drawings* of *Habits* of divers *Nations*, of several *Trades*, of *Utenfils, Weapons, Fountains, or Wells*, with other *Prints* useful in *Joyners* and *Masons Work*. *Cuts* of *Figures* in different *Postures*, as *Writing, Reading and Meditating*; with all the *Utenfils* used in *Writing, &c.* during some *Ages*. *Cuts of Schools*. The *Heads* of some *Arithmeticians*; *Alphabets*; *Specimens* of *Knot-work*, and some *Great Text* and other *Letters*. *Specimens* of *Letter-Graving*. *Heads* of *Writing Masters, Dutch, French, English*. *Specimens* of *Letters Engraven in Small*; as also of *Short Hand, &c.* *Heads* of *Short Hand Writers*, and *Specimens* of their *Works*, and many other things. *Title-pages of Books*, and *Printers Devices*; *Printing* in the *Spanish Netherlands, Spain* and *Portugal*; *Titles of Books* published by *English Catholicks*, *Alphabets* of *Plantin's Capital Letters, &c.* *Title-Pages, Alphabets, and Printers Devices*, used in *Basil, Zurich*, and in other *Places* in *Switzerland*. The like for the *United Netherlands*. The like for *France*. The like for *Germany*, with some others of *Poland, Switzerland, Denmark, Bohemia*, and *France*. The like for *Italy*, with some others of *Geneva, Sicily, &c.*

Collection of *Acts of Parliament, Ordinances, Proclamations, &c.* *Regulating the Press*; with many other *Papers*. *Proposals* for *Printing* particular *Books*. *Catalogues* of *Books*, relating to *Painting, Printing, &c.* *Specimens* of *Paper* differently *Coloured*. *Marks* on the *Outsides* of *Reams of Paper*; with *Orders, Cases, Reasons, &c.* relating to the *Manufacture*. *Old Prints or Cuts* from *A.D. 1467*. with the *Effigies and Devices* of many *Printers, Foreigners and English*; with other *Cuts* and *Specimens* of *Paper, &c.* Collections of *Epitaphs* of the *Printers* in *Basil*; with the *Life* of *John Froben*; *Catalogues* of *Books, &c.* Collections relating to the *Lives* of the *Engravers* of divers *Countries*.

*Titles* of *Books* printed in most *Parts* of *Europe*, before the *Year 1500*. Collection of *Patents* for *Printing Law-Books, &c.* Some *German Cards*. With many other *Volumes* of *Collections* of the *Kinds* above mentioned, though not so well sorted.

And these *Title-Pages* of *Books* are really useful, upon many *Accounts*, viz. as being authentick and exact, when, as in most *Catalogues*, the *Titles* are abbreviated and otherwise imperfect. Besides, these *Titles* informed



me of many Books I had never heard of before ; and from them I have been enabled to enquire for several Books, some of which I have since procured to my great Satisfaction. And it is my Opinion, that there are but few curious Men, but, upon the View of this Collection, will own they have here met with several *Titles*, or other *Fragments of Books*, in their several ways, which they knew not of before. And thus we see, that a single Leaf of Paper, though not valuable in its self ; yet when come to be Part of a Collection, may be of good Use, not only in respect of the *Matter* it treats of, but as to the *Mark of the Paper*, the *Date*, *Printer's Name*, *Country*, *Title*, *Faculty*, &c.

IV. I have the outward Skin of the Maw of a Fish that was taken at *Macassar*, *Febr. 16<sup>80</sup>*. and was given to Mr. Rob. Midgley at *Batavia* by a *Dutch-man*, who took it out of the Fish. That the Fibres or Vessels do curiously and naturally resemble a Tree, with its Stem, Branches, Leaves, &c. will appear by the enclosed Figure of it, which, though but slenderly performed, is the best I have time to do now, and is so like the Original that it will save the Labour of any further Description, (for 'tis exactly the Bigness and Shape of this Draught,) save that the Skin is very thin, whitish, and transparent, and the Veins that compose the Stem and greater Branches, are now rather black than dark red, as I presume they were at first, the Leaves of a sort of dark and faded green, variegated. The *Crystal* was given me by Dr. *Jabez Gay* of *Newcastle*, who brought it from *Milan*: whose Description I will make bold with, only premising his Arguments upon a sort of *Spar* within a *Flint*, sent me at the same time. That within the *Flint* (says he) seems to differ from the rest of its Substance, and somewhat to resemble *Spar*: Though after all, *Spar* being nothing else but a *Crystalline* sort of *Lime-stone*, it differs not from *Flint* in Reality, but only in Appearance, *i. e.* in the manner of *Concretion*, though if the inclosed Matter had, in its Nature, differ'd from the rest of the Stone, the thing had not been very uncommon, it being usual enough for Stones (especially those of a globular or oval Form) to have Coat upon Coat, and those Coats sometimes very different one from another, some of them soft, some hard, nay, sometimes after a long Space of time, one of these Coats will shrink from another, after the manner of a Kernel when the Shell grows dry ; and then if the enclosed Substance continue soft and marly, they call that Stone *Geodes* ; but if stony, it makes one of those rattling Stones that are known by the Name of the *Ætites*, or Eagle-Stone. To confirm what I have here advanc'd, it were easy to prove by many Instances that it is no unusual thing for Stones to enclose Substances of a very differing Nature from themselves ; the *Shells* in the *Suffex Marble*, herewith sent you, is one Proof of this Matter, and the *Stones* found in our *Coal-pits*, and known amongst the Workmen by the Name of *Cat-heads*, may serve for another ; they are found in a particular *Stratum* near the Coal, and enclose a *Fern*, or sometimes *Polypody Leaf* in the

*Observables in*  
*Mr. Thores-*  
*by's Museum;*  
*n. 277. p. 1070.*

Plate 17.  
Fig. 5.



the middle of them; and for that Reason being struck with a Hammer very readily break there: I think they are a sort of *Iron Stone*, akin to that which they call in *Staffordshire Ballmine*, and Dr. *Lister*, *Minera ferri pilæformis*; they have it upon the Western Coasts near *Whitehaven*, and call it there by the Name of *Cat-scamps*. I have seen of it too upon the *Yorkshire Coasts* in *Robin Hood's Bay*: You may if you please, till I find a better Name, call it *Lapis mineræ ferri, Pilæformi similis, in cujus Meditullio, unum vel plura filicis folia repræsentantur*. (I have since, from my said worthy Friend receiv'd Specimens of both sorts.) And to give you an Instance that *one and the same Piece of Rock does not always shoot into Stone at one and the same time, but first one Part of it and then another*, and they too not after the same regular manner, but irregularly enough, I have sent you a piece of *Rock Crystal*, where you may easily observe the *modus concrescendi* in the middle to have differed from that of the outside; nay, sometimes I have seen in the middle of some transparent Stones a small drop that never would take the solid form of the rest of the Stone at all. The third Curiosity is a piece of an *Iron-bolt* (two Inches long) found in a *Stone Quarry*, now return'd into *Iron Ore* again; this being a Property that Iron has, and no other Metal, as Dr. *Lister* observes in his Journey to *Paris*.

The fourth is *Copper Ore* so regulated, shot into an *Octoedrous Form*, which has eight solid Triangles, and consequently six angular Points; my said Cousin receiv'd it from the copper Groves at *Fallum*, where very many of the same Form were then found.

Of Pewter  
Money, coin'd  
in Ireland, by  
Mr. Tho. Put-  
land to Mr.  
Thoresby. n.  
297 p. 1875.

V. King *James II.* having turned all the Brass Guns of *Ireland*, and all the Brass and Copper Vessels of Protestants, that he could seize, into Coin, viz. Half-Crowns somewhat bigger than an *English Half-penny*, Shillings broader but not so thick as a Farthing, and Six-pences in proportion; it was order'd to pass current in all Payments, even in Bonds, and discharge of Judgments and Statutes; (insomuch that if Ages to come knew not the reason, they would admire to be told, that there was a time when Men absconded, to avoid receiving their Debts, as many here did:) But these stocks of Metal being all spent (which he began to Coin in *June 1689.*) and no Circulation to bring them back into his Treasury, he call'd in all that he had coined, and the Half-Crowns, which before were stamped with a Face, were re-stamped with his *Effigies* on Horseback, and then paid out to those who brought them in, as Crowns; and the smaller Coins were melted down, and re-coined again under the same Denomination, but with less Metal. After the turn was served by this Stratagem, he had not wherewithal to import Copper and Brass; but, for want of it, fell foul on the Pewter-Dishes, &c. — And the Piece I sent you of that Metal was coined for five Shillings; and the Proclamation to make it passable was as ready as the Stamps, for it was prepared: But King *William* passing the *Boyne*, prevented their proclaiming



proclaiming it. There was very little of it coined, for our Government could meet with none of it; until one Day, rummaging all their tinkery Treasure, that they had left behind them in *Dublin* when they were routed, by accident I met with one Bag of one hundred and fifty of those Pieces. So that the Piece I sent you, altho' its of no intrinsic Value, is a Rarity; and had I thought it would have been acceptable, I would have sent you a Specimen of every sort that he had coined and re-coined here.

This valuable Curiosity has the same Inscription on both sides, as the common Brass Crowns; but there is this Legend added upon the Rim of it, *MELIORIS TESSERA FATI. ANNO REGNI SEXTO.*

VI. The Equality of Males and Females is not the Effect of Chance but Divine Providence, working for a good End, which I thus demonstrate: *Of the constant Regularity observ'd in the Births of both Sexes, by Dr. Arbuthnott. n. 328 p. 186.*

Let there be a Die of two sides, M and F, (which denote Cross and Pile), now to find all the Chances of any determinate Number of such Dice, let the Binome  $M + F$  be raised to the Power, whose Exponent is the Number of Dice given; the Co-efficients of the Terms will shew all the Chances sought. For example, in two Dice of two sides  $M + F$  the Chances are  $M^2 + 2MF + F^2$ , that is, one Chance for M double, one for F double, and two for M single and F single; in four such Dice there are Chances  $M^4 + 4M^3F + 6M^2F^2 + 4MF^3 + F^4$ , that is, one Chance for M quadruple, one for F quadruple, four for triple M and single F, four for single M and triple F, and six for M double and F double; and universally, if the Number of Dice be  $n$ , all their Chances will be expressed in this Series.

$M^n + \frac{n}{1} \times M^{n-1}F + \frac{n}{1} \times \frac{n-1}{2} \times M^{n-2}F^2 + \frac{n}{1} \times \frac{n-1}{2} \times M^{n-3}F^3 + \dots$  It appears plainly, that when the Number of Dice is even, there are as many M's as F's in the middle Term of this Series, and in all the other Terms there are most M's or most F's. If therefore a Man undertake with an even Number of Dice to throw as many M's as F's, he has all the Terms but the middle Term against him; and his Lot is to the Sum of all the Chances, as the Co-efficient of the middle Term is to the Power of 2 raised to an Exponent equal to the Number of Dice: so in two Dice his Lot is  $\frac{2}{4}$  or  $\frac{1}{2}$ , in three Dice  $\frac{6}{12}$  or  $\frac{1}{2}$ , in six Dice  $\frac{20}{64}$  or  $\frac{5}{16}$ , in eight  $\frac{70}{256}$  or  $\frac{35}{128}$ , &c.

To find this middle Term in any given Power or Number of Dice, continue the Series  $\frac{n}{1} \times \frac{n-1}{2} \times \frac{n-2}{3}$ , &c. till the Number of Terms are equal to  $\frac{1}{2}n$ . For example, the Co-efficient of the middle Term of the tenth Power is  $\frac{10}{1} \times \frac{9}{2} \times \frac{8}{3} \times \frac{7}{4} \times \frac{6}{5} = 252$ , the tenth Power of 2 is 1024, if therefore A undertakes to throw with ten Dice in one throw an equal Number of M's and F's, he has 252 Chances out of 1024 for him, that is, his Lot is  $\frac{252}{1024}$  or  $\frac{63}{256}$ , which is less than  $\frac{1}{4}$ .

It will be easy by the help of Logarithms, to extend this Calculation to a very great Number, but that is not my present Design. It is visible from



from what has been said, that with a great Number of Dice, A's Lot would become very small; and consequently (supposing M to denote Male and F Female) that in the vast Number of Mortals, there would be but a small part of all the possible Chances, for its happening at any assignable time, that an equal Number of Males and Females should be born.

It is indeed to be confessed that this Equality of Males and Females is not Mathematical but Physical, which alters much the foregoing Calculation; for in this Case the middle Term will not exactly give A's Chances, but his Chances will take in some of the Terms next the middle one, and will lean to one side or the other. But it is very improbable (if mere Chance govern'd) that they never would reach as far as the Extremities: But this Event is wisely prevented by the wise Oeconomy of Nature; and to judge of the Wisdom of the Contrivance, we must observe that the external Accidents to which Males are subject (who must seek their Food with danger) do make a great Havock of them, and that this loss exceeds far that of the other Sex, occasioned by Diseases incident to it, as Experience convinces us. To repair that Loss, provident Nature, by the Disposal of its wise Creator, brings forth more Males than Females; and that in almost a constant proportion. This appears from the annexed Tables, which contain Observations for eighty two Years of the Births in *London*. Now, to reduce the whole to a Calculation, I propose this.

*Problem.* A lays against B, that every Year there shall be born more Males than Females: To find A's Lot, or the value of his Expectation.

It is evident from what has been said, that A's Lot for each Year is less than  $\frac{1}{2}$ ; (but that the Argument may be stronger) let his Lot be equal to  $\frac{1}{2}$  for one Year. If he undertakes to do the same thing 82 times running, his Lot will be  $\frac{1}{2}|^{82}$ , which will be found easily by the Table of Logarithms to be  $\frac{1}{4836 \cdot 0000 \cdot 0000 \cdot 0000 \cdot 0000 \cdot 0000 \cdot 0000 \cdot 0000}$ . But if A wagers with B, not only that the Number of Males shall exceed that of Females, every Year, but that this Excess shall happen in a constant Proportion, and the Difference lye within fix'd limits; and this not only for 82 Years, but for Ages of Ages, and not only at *London*, but all over the World; (which 'tis highly probable is Fact, and designed that every Male may have a Female of the same Country and suitable Age) then A's Chance will be near an infinitely small Quantity, at least less than any assignable Fraction. From whence it follows, that it is Art, not Chance, that governs. There seems no more probable Cause to be assigned in Physicks for this Equality of the Births, than that in our first Parents Seed there were at first formed an equal Number of both Sexes.

*Scholium.* From hence it follows, that Polygamy is contrary to the Law of Nature and Justice, and to the Propagation of human Race; for where Males and Females are in equal number, if one Man takes twenty Wives, nineteen Men must live in Celibacy, which is repugnant to the Design of Nature; nor is it probable that twenty Women will be so well impregnated by one Man as by twenty.

Christen'd.



## Christened.

Anno.	Males.	Females.
1629	5218	4683
30	4858	4457
31	4422	4102
32	4994	4590
33	5158	4839
34	5035	4820
35	5106	4928
36	4917	4605
37	4703	4457
38	5359	4952
39	5366	4784
40	5518	5332
41	5470	5200
42	5460	4910
43	4793	4617
44	4107	3997
45	4047	3919
46	3768	3395
47	3796	3536
48	3363	3181
49	3079	2746
50	2890	2722
51	3231	2840
52	3220	2908
53	3196	2959
54	3441	3179
55	3655	3349
56	3668	3382
57	3396	3289
58	3157	3013
59	3209	2781
60	3724	3247
61	4748	4107
62	5216	4803
63	5411	4881
64	6041	5681
65	5114	4858
66	4678	4319
67	5616	5322
68	6073	5560
69	6506	5829

## Christened.

Anno.	Males.	Females.
1670	6278	5719
71	6449	6061
72	6443	6120
73	6073	5822
74	6113	5738
75	6058	5717
76	6552	5847
77	6423	6203
78	6568	6033
79	6247	6041
80	6548	6299
81	6822	6533
82	6909	6744
83	7577	7158
84	7575	7127
85	7484	7246
86	7575	7119
87	7737	7214
88	7487	7101
89	7604	7167
90	7909	7302
91	7662	7392
92	7602	7316
93	7676	7483
94	6985	6647
95	7263	6713
96	7632	7229
97	8062	7767
98	8426	7626
99	7911	7452
1700	7578	7061
1701	8102	7514
1702	8031	7656
1703	7765	7683
1704	6113	5738
1705	8366	7779
1706	7952	7417
1707	8379	7687
1708	8239	7623
1709	7840	7380
1710	7640	7288



Of Man's  
feeding on  
Flesh, by Dr.  
Wallis. n. 269.  
p. 769.

VII. 1. I remember to have read (about fifty Years ago) in one of *Gassendus's* printed Epistles, (printed among some previous Pieces of his, before the body of his Works was published,) a suggestion of his, (which he seems to espouse as his own Opinion) as if he thought it not (originally) natural for *Man* to feed on *Flesh*; though by long usage (at least ever since the Flood) we have been accustomed to it, and it is now familiar to us; but rather on Plants, Roots, Fruits, Grain, &c. And I take it to be the Opinion of many Divines, that *before the Flood*, Men did not use to feed on *Flesh*, because of what we have in *Gen. ix. 3.* where God says to *Noah*, (after the Flood,) *Every moving thing that liveth, shall be meat for you, even as the green Herb have I given you all things:* Compared with *Gen. i. 29.* where God says to *Adam*, *I have given you every Herb bearing Seed, and every Tree in the which is the Fruit of a Tree yielding Seed, to you it shall be for Meat;* but without any intimation of his feeding on the *Flesh of Animals*, which seems to be an insinuation to that purpose, and is commonly taken so to be.

Yet, I confess, I have some doubt therein remaining, seeing that we find, very early, that *Abel* was a *Keeper of Sheep*, as well as *Cain* a *Tiller of the Ground*, both Employments seeming equally in order to their Food and Sustenance. And their first *Cloathings* were the *Skins of Animals*. It may perhaps be thought, that these Animals were *Slain for Sacrifice*, and the *Sheep* fed only for that purpose, but even their Sacrifices seem to have been offered but as a Portion (or First-fruits) of things appointed for Food; and that as *Cain* was not to sacrifice the *whole* Fruit of his *Tillage*, so neither was *Abel* the whole Product of his *Sheep*, but the best thereof (the Firstlings of his Flocks, and the Fat thereof) and reserving the rest for his own use. And it cannot seem likely, that God would give to *Noah* after the Flood, a greater Dominion over other Animals, than had been given to *Adam*, in *Paradise before the Fall*. And I should then consider this Permission to *Noah*, not as contra-distinct from that to *Adam*, (as of what is now permitted, which before were not;) but rather as Introductive of the *Prohibition* which presently follows, to wit, *Tho' he might eat Flesh, even as the green Herb, (so far as it might be wholesome Food:)* yet, *not with the Blood thereof;* that is, not *Raw Flesh*; not *carnem crudum*, or *carnem cum cruore*. I add also, that the same Rule is given to other Animals, *Gen. i. 30.* as is to Man, at *vs. 29.* *I have given them every green Herb for Meat:* Yet there are, we know, many carnivorous Animals, without any further Permission that we know of.

I shall consider it (with him) as a Question in Natural Philosophy, whether it be proper Food for Man.

The consideration insisted upon by *Gassendus*, is from the Structure of the *Teeth*, (and, as I remember this only) that our Teeth are mostly either *Incisores*, or *Molitores*; not such as (in carnivorous Animals) are proper to *tear Flesh*, except only four, which are called *Canini*: As if Na-



ture had rather furnished our Teeth, for *cutting* Herbs, Roots, &c. and for bruising Grain, Nuts, and other hard Fruits, than for *tearing* Flesh, as carnivorous Animals do, with their Claws, and sharp Teeth. And, even when we feed on Flesh, it is not without a preparative *Codtion*, by boiling, roasting, baking, &c. And, even so, we forbid it to Persons in a Fever, or other like distempers, as of too hard digestion. And *Children* (before their Palates are vitiated by custom) are more fond of *Fruits* than of *Flesh-meat*. And their breeding *Worms* is wont to be imputed to their *too early* feeding on *Flesh*.

This Conjecture did presently suggest to me another speculation. There is in Swine, Sheep, Oxen, and, I think, in most Quadrupeds that feed on Herbs or Plants, a long *Colon*, with a *Cæcum* at the upper end of it, or somewhat equivalent, which conveys the Food, by a long and large Progress, from the Stomach downwards, in order to a slower Passage, and longer stay in the Intestines: But in Dogs, of several kinds, and I suppose, in Foxes, Wolves, and divers other Animals which are carnivorous, such *Colon* is wanting; and, instead thereof, a more short and slender Gut, and quicker Passage through the Intestines.

That which I would propose hereupon is, that you would consider, whether it do generally hold, or how far forth, that Animals which are not carnivorous, have such *Colon*, or somewhat equivalent; and that those which are carnivorous have it not. For if so, it seems to be a great Indication, that Nature, which may be reasonably presum'd to adapt the Intestines to the different sorts of Aliments that are to pass through them, doth accordingly inform us, to what Animals Flesh is proper Aliment, and to what it is not; and that from thence we may judge more solidly, than from the Structure of the Teeth only, whether or no Flesh were designed as proper Food for Man.

Now it is well known, that in *Man*, and, I presume, in the Ape, Monkey, Baboon, &c. such *Colon* is very remarkable; and the like in your ingenious and accurate \*Dissection of your *Homo Sylvestris*, which may therefore be thence conjectured, not to belong naturally to the carnivorous Tribes, if that rule hold. 'Tis true, that the *Cæcum* in Man is very small, and seems to be of little or no use: But in a *Fætus*, it is in Proportion much larger than in Persons adult. And it's possible, that our customary Change of Diet, as we grow up, from what originally would be more natural, may occasion its shrinking into this contracted Posture. But I add this also, that *Man's* being indu'd with *Reason*, doth supply the want of many things, which, to other Animals may be needful. Man is not covered with such quantity of Hair or Feathers all over his Body, which to other Animals serve for Cloaths; but can, by his use of Reason, supply himself with Cloaths suitable to every Climate, and different Seasons. He is not furnished with Claws, Hoofs, Horns, &c. which serve for *Arms* to other Animals, but can, by the use of his Reason, supply himself with Weapons, and other Instruments for different

v. Ph. Transf.  
n. 256.



ferent Occasions, to much better advantage. And, in the present case tho' *raw Flesh* be not proper, as 'tis to some other Animals, he can by preparative Coctions, and other Expedients, render it more agreeable. Nor is he wholly destitute of *Dentes Canini*; but is indeed furnished with all sorts of Teeth, for all sorts of wholesome Food. I take the Sheep, the Goat, the Swine, the Oxe, the Ass, the Camel, the Elephant, the Hart, the Hare, the Rabbet, the Mouse, &c. not to be carnivorous; but the Dog, the Wolf, the Fox, the Cat, the Lyon, the Leopard, the Tyger, &c. to be naturally carnivorous, which of all these have, or have not the *Colon*, or what other distinctive Mark may be observed between these different Tribes of Animals, I think may deserve a serious Consideration.

An Answer  
by Dr. Tyson,  
ib. p. 774.

2. The Argument you propose from the Conformation of the *Intestines*, why *Man* should not be *carnivorous*, seems far more rational than that which *Gassendus* urges, from the Structure of the *Teeth*. But, before I come more particularly to consider your *Hypothesis*, give me leave to remark, that, had *Man* been design'd by Nature not to have been a *carnivorous Animal*, no doubt there would have been observed, in some part of the World, Men which did not at all feed upon *Flesh*. But since no History (as I know of) furnishes us with such an instance, I cannot but think what hath been done universally by the whole *Species*, must be *Natural* to them. What the *Pythagoreans* did, in *abstaining from Flesh*, was upon the Notion of a *μετεμψύχωσις*, or *Transmigration of Souls*, a mistake in their Philosophy, and not a Law of Nature. And, tho' in some Countries Men feed more freely on *Flesh*, in others more sparingly, this is owing to their own Choice, from the Advantage they find thereby. Nature having given Mankind *Reason*, he can, or ought to elect what Food he finds most agreeable to him, in the Climate he lives in; and is not determin'd to any one sort, but has liberty to all. And 'tis as probable, that the *Ante-diluvial* World had so likewise.

We shall consider it as a Question in *Natural Philosophy*; Whether from the Observation of the Structure of the Parts in *Man*, we can find reason to think Nature did, or did not, assign him to be *Carnivorous*. For I am of *Gassendus* his Opinion, *Licet ex conformatione Partium Corporis Humani, conjecturas desumere ad Functiones merè Naturales*. For, all the Knowledge we have of the *Uses* of the Parts in Animal Bodies, is by observing Nature's wonderful Contrivance in the Formation of them; who most wisely adapts them to the *Uses* they are designed for. Not because they are casually so and so formed, are they necessarily put to such and such *Uses*: But therefore they are so contrived, that they may perform such Offices in the Oeconomy of Animal Bodies, as Nature intend'd them for. *Longe proinde faceſſat illa Empedoclis, Epicuri, aliorumque Opinio, ſc. Membra Animalium non eſſe facta propter Uſum; ſed, Membris ita caſu factis, & coaleſcentibus, ipſorum uſum Accommodatione Experientiaque varia adinventum*, ſaith the ſame *Gassendus*.

I come



I come therefore now more closely to our Business. And consider the Observation you have made of the different Formation of the *Intestines* in Carnivorous Animals, from those that are to be met with in such as do not feed upon Flesh, but other Food. And indeed this seems to me to be of far greater weight, and to carry more strength in it, than any thing I have met with before. And all the Instances you give are very true.

We shall therefore first of all observe, That the *Ductus Alimentalis* (for so I call the *Gula*, the *Stomach*, and *Intestines*; all which make but one continued *Canalis* or *Ductus*;) This *Ductus*, I say, is properly the true *Characteristick* of an Animal, or *Proprium quarto modo*. For there is no *Animal* but hath such a *Ductus*; and whatsoever hath such a *Ductus*, may properly enough be ranged under the *Classis* of *Animals*. *Plants* receive their Nourishment by numerous Fibres of their Roots, but have no common *Receptacle* for the digesting the Food received, or *Vent* for carrying off the *Recrements*: But in all, even the lowest Degree of Animal Life, we may observe a *Stomach* and *Intestines*; even where we cannot perceive the least Formation of any *Organ* of the *Senses*, unless that common one of *Tactus*; as in an *Oyster*. Where also we may observe a sensible *Muscular Motion*, or Contraction; though it would be difficult to assign what *Part* should be reckoned the *Brain*, or *Medulla Spinalis*, from whence the *Nerves* arise that give it so strong a Motion. Now this *Ductus* being so principal a *Part* in an Animal, and its *Use* being for the receiving and digesting the *Food*, and distributing the *Chyle*; 'tis reasonable to suppose, that, according to the Difference of the Food, the Structure of the *Organ* should be also different; or, where the *Organ* was the same, there the *Use* was the same too, for the receiving, digesting and distributing the same sort of *Food*. Man therefore having these Parts formed, not like Carnivorous Animals, as you well observe; but more resembling those that live on Herbs, Roots, Fruits, &c. it may seem reasonable to conclude, that Nature never designed him to live on Flesh; But that the Wantonness of his Appetite, and a depraved Custom, had inured him to it. For, as *Gassendus* remarks in the same *Epistle*, I have so often quoted, (*viz. Epist. Jo. Bapt. Helmont. operum, Tom. 6. pag. 19.*) Custom may make that seem natural to us, which Nature never intended. As he instances in a *Lamb* that was bred on Ship-board, which refused the green Pasture of the Fields, for the Diet it was formerly used to. And I have often seen here in *London* (and it being a thing so unusual, I take leave to mention it) a *Horse*, that, with a great deal of Pleasure, would eat *Oysters*, scratching them, Shell and all, between his Teeth, and swallowing them; And this he took to by Accident, being left at a Tavern-door, where stood a Tub of *Oysters*: And since hath frequently done it, whenever they were offered him. Now *Gassendus* observes, that *Children* (from whom he thinks we may better take the *Instincts* of Nature, than from our Appetites when depraved by Custom) are much fonder of *Fruit* than of any *Flesh* that is offered them; and therefore he supposes it more natural to them.

The



The *Instance* you give, wherein the Structure of the *Intestines* of Carnivorous Animals is different from that in Men, is, that the former want a *Colon*; whereas in Men there is a very large one, which is not to be observed but in such Animals as live upon Fruits, Roots, Herbs, &c. What therefore you propose to me, is to consider, *Whether it does generally hold (or how far forth) that Animals that are not Carnivorous have such a Colon, (or somewhat equivalent) and those that are Carnivorous have it not.* I shall begin with those *Animals* that are *Carnivorous*, and have no *Colon*, or large *Cæcum*. For though they may have the *Appendicula Vermiformis* (as some Anatomists call it) yet if that is not extended or filled with the *feces*, which the other Guts contain, I think it not properly to be esteemed as a distinct Gut, or to come into that Number, since here it does not perform the Office of a Gut, in containing the Food or Excrement. So, in Man, in Dogs, and other Animals, when it is thus contracted, I exclude it out of the Number of the *Intestines*, though by Use and Custom, (but I see no reason for it) 'tis commonly reckoned one of the *Intestina crassa*.

Animals therefore that have no *Colon*, or large *Cæcum*, though some of them have this *Appendicula Vermiformis*, and are *Carnivorous*, I reckon:

1. The *Dog-kind*; under which, beside their own *Species*, may be included the *Fox*, the *Wolf*, the *Coati Mondi*, the *Badger*, the *Otter*, &c.

2. The *Vermin-kind*; as the *Weesel*, the *Fitchet*, the *Polecat*, the *Martin*, &c. Both these Kinds have a Bone in the *Penis*; have no *Colon* or *Cæcum*; some have the *Appendicula Vermiformis*; and all are *Carnivorous*.

3. The *Cat-kind*; to which may be reduced, besides their own *Species*, the *Lion*, the *Tiger*, the *Leopard*, the *Lynx*, the *Catamountain*, &c. 'Tis true, the *French Memoirs for the History of Animals*, tell us, that a *Lion* has a *Colon* eighteen Inches long, and an *Appendicula Vermiformis* three Inches; and that in a *Lioness* the *Colon* was two Foot, and the *Cæcum* two Inches long. Now I question whether we may properly call this a *Colon* or no. For though the Gut about this Place may be more extended than in others, yet not having those *Ligaments* whereby the Gut is corrugated into *Cells*, as in a human Body, I think strictly it does not deserve that Name. So in a *Cat*, the *Intestine*, at the Place of the *Colon*, is larger, but, for the same reason, shall not call it a *Colon*. And though a *Cat* has a small Projection of the Gut, which may be called a *Cæcum*, because it contains *feces*; yet, since 'tis so very short, we will not insist on it. 4. A *Bear* hath no *Colon* or *Cæcum*. 5. A *Mole*, which feeds on *Worms* and *Insects*, has no *Colon* or *Cæcum*. In the next Place we will consider those *Animals* that are not *Carnivorous*, but live upon Herbs, Fruits, Roots, &c. all which have a *Colon*, or *Cæcum*, or both; For, I think it much the same, whether they have either one of these only, or both; provided that the Capacity of the Gut there be large and extended, and do contain *feces*. I will enumerate first those Animals that have both a *Colon* and a *Cæcum*, or at least a *Colon*. As,

1. The



1. The *Horse-kind*; in which may be included the *Ass*, *Mule*, &c. which have a large *Colon* and *Cæcum*. 2. The *Elephant* hath a great *Colon* and *Cæcum*. 3. The *Dromedary* and *Camel*, a long *Colon*. 4. The *Swine-kind*, whose *Species* is numerous, have a large *Cæcum* and *Colon*. 5. The *Guiny-pig*, a *Colon* and *Cæcum*. 6. The *Castor*, or *Beaver*, has a large *cellulated Colon* and *Cæcum*. 7. The *Hare-kind*, has a large *Colon* and *Cæcum*. The *Cæcum* in the *Rabbit* is very long, and in the middle, a *cochlear Valve*. 8. The *Ape* and *Monkey-kind*, have a *cellulated Colon*, and short *Cæcum*.

Now there are several Animals that have a large *Cæcum* and no *Colon*, and these too are not *Carnivorous*, but live upon *Grass*, *Fruits*, *Roots*, &c. as, 1. The *Neat-kind*, as the *Oxe*, the *Barbary Cow*, &c. 2. The *Sheep-kind*, which is numerous. 3. The *Stag-kind*, to which may be referred, the *Elk*, the *Rain-deer*, the *Stag of Canada*, &c. 4. The *Goat-kind*. 5. The *Gazella* or *Antelope*. 6. The *Squirrel-kind*. 7. The *Rat-kind*.

By all which Lists, you may plainly perceive, what good grounds you have for forming your Notion; since there are so many Animals that are *Carnivorous*, that have no *Colon* or *Cæcum* at all; and, on the other hand, how vast a Number are there that are not *Carnivorous*, that have either a *Colon* or *Cæcum*, or both.

But we may be mistaken in the Conclusion we may be apt to draw from hence: and may as well argue, that because the *Neat-kind*, the *Stag-kind*, the *Goat-kind*, and the *Sheep-kind*, that live on *Herbage*, have *four Stomachs*, therefore those that have not four *Stomachs*, were not design'd by Nature to be *Graminivorous*. Now the *Horse-kind*, the *Hare-kind*, &c. have but one *Stomach*, and yet their Food is *Grass*. And the Case is here the more remarkable, because the *Stomach* is a Part more principally concerned in digesting the Food. The *Intestines* are for separating the *Chyle* and carrying off the *Fæces*. Yet we observe even in Animals, that live on the same sort of Food, that their *Stomachs* are very different. One would therefore be more apt to think, that for digesting the Variety of Food, and what is of a different Nature, that the *Organ* that is to perform it, should be different too. Yet we find the *Stomachs* of Animals that live upon *Flesh*, of others that live upon *Fruits*, and others that live upon *Grass*, to be much alike; that 'twould be difficult to assign any Difference between them. If therefore we cannot make a Conclusion from the Structure of the *Stomach*, what Food is most natural to an Animal, much less one would think from the *Colon* or the *Cæcum*; those Parts of the *Ductus Alimentalis* that are remote from the *Stomach*; and being so, seem rather as a *Cloaca*, for the Reception of the *Fæces*, than otherwise of any great Concern in digesting the Food, or distributing the *Chyle*. Since *Man* therefore hath all manner of *Teeth*, fit for Preparation of all sorts of Food, before it be convey'd to the *Stomach*; I should rather think, that *Nature* did intend he should live upon all; or at least is so bountiful as not to deny him any, or stint him to one sort only. So in like manner,



ner, since the *Organ* here in Man, is fitly adapted for digesting all sorts of Food, I should rather incline to conclude, that therefore *Nature* intended all sorts for him: Which *God Almighty* assures us he did, *Every moving thing that liveth shall be meat for you, even as the green Herb have I given you all things.* Gen. ix. 3.

But perhaps you may expect I should give you some Instances in *Brutes*, where it doth not hold, that all *Carnivorous Animals* have no *Colon* or *Cæcum*, though, as to Man, the Case may be different. Now the \* *Cariacou* or *Opossum* had a long *Colon*, though not *cellulated*, and a large *Cæcum*, that received all the *Fæces* as they pass down; Yet this Animal feeds on *Poultry* and *Birds*. And I have a Male *Opossum* now by me, that feeds on nothing but *Flesh*. On the other hand, the *Hedge-hog* or *Urchin*, that hath no *Colon* or *Cæcum*, and therefore by your Rule should be *Carnivorous*, feeds on *Roots*, *Fruits*, *Herbs*, &c. and not on *Flesh*. *Hogs* likewise, that have both a *Colon* or a *Cæcum*, will feed upon *Flesh* greedily enough, when they can meet with it; though their ordinary Food be of another kind. And a *Rat* and *Mouse* that have a large *Cæcum*, but no *Colon*, feed upon *Bacon*, as well as *Bread* and *Cheese*. If what † *Ælian* tells us can be relied upon, you have an Instance in the *Neat-kind* also. For he assures us, Ἀγελώτατοι δὲ ἀρετῇ ἦσαν τῶν ζώων οἱ τῶν Αἰθιοπῶν ταῦροι, καὶ καλὸν μὲν αὐτοῖς καὶ φάγοντο. So \* likewise he mentions *Horses* and *Sheep* that feed upon *Fish*. But these Stories I suppose he hath taken from the *Indian Historians*; whose Credit I have sufficiently examined; and shall therefore lay no Stress upon them. Your *Observation* therefore as to *Brutes*, though it may hold for the most part true, yet it is not universal. And, as all other Rules, may have some Exception.

\* Phil. Trans.  
n. 239. p. 105.  
Abr. Vol. II.  
p. 887.

† Hist. Anim.  
lib. 17. cap. 45.  
ib. cap. 25.

\* Discourse  
concerning the  
Pigmies of the  
Ancients.

A Reply, by  
Dr. Wallis,  
ib. p. 784.

3. I am inclined to think, That all Nations (as well before as since the Deluge) have used to feed on *Flesh*. Which is a strong Presumption (as you well observe) that to feed on *Flesh* (*duly prepared*) is not wholly *Unnatural* for Mankind. On the other hand; I believe you think (as I do) that *Raw Flesh* is not a *Natural Food* for our Bodies. I do not know that any Nation have (of Choice) used to feed on *Raw Flesh*; unless in Cases of *Extremity*, or when they have not the Convenience of *Preparing* it by previous *Cōction*, or somewhat equivalent. (For I put a great Difference between *Raw Flesh* (which is the common Food of what we call *Carnivorous Animals*;) and *Flesh duly prepared* for our Food. If any there be that (of Choice) feed on *Raw Flesh*, I look upon it as a Case *Anomalous*; like that of the *Lamb* mentioned by *Gassendus*; and the *Horse* (you mention) that eats *Oysters*. I may add, the *Rat* eating *Bacon*, for want of other Food, (which yet is not quite void of *Cōction*; and the *Swine* sometimes eating *Poultry*. Which latter, I do not take to be purely *Natural*; but rather the Effect of an *Appetite Depraved* by Custom; because much of the *Hog-Wash* we give to *Swine*, ariseth from the *Cōction* of *Flesh* for our own Use; which does inure the *Swine* (a *Voracious Animal*) to the *Taste of Flesh*, and makes it familiar to them. But *Flesh*,  
*duly*



*duly prepared for our Food*, I look upon as a thing very different from *Raw Flesh*, and which may be proper Food for Man; if (and so far as) it agrees with our *Health*: (which Caution is to be observed, as to other Food, as well as *Flesh*.) And this I refer to the Care of the *Physician* and *Apothecary*, rather than the *Cook* and the *Confectioner*: For these do oft comply with the *Wantonness* of the *Palate*, rather than the *Health* of the Body. I leave it to you to consider, from what *Reason*, and for what *Use*, the Passage of *Flesh* through the *Ductus Alimentalis*, should (ordinarily) be more *Quick*, and that of *Herbs* more *Slow*; (For that seems to be the Cause, the *Colon* making the Way *Longer*, and the Passage *Slower*;) and in what Degree it is so. I say *Ordinarily*; because, in Case of *Catharticks* (or what is equivalent) the Speed is quickened. And, again; When as Nature seems to have (originally) designed in Man a large *Cæcum*, as in some other Animals, (and which, if I mistake not, is in the *Fœtus* larger in Proportion to the rest of the Intestines, than in Persons adult,) How it comes to pass that it is now of little or no Use; but shrinks up into an *Appendicula Vermiformis*; Whether or no this may partly proceed from our feeding so much on *Flesh*; which will not admit so great a *Remora*, as a large *Cæcum* may occasion in other Animals.

VIII. The Excellent Sir *William Petty* reckons about twenty eight Millions of Acres in *England*: Others, twenty nine Millions; Others, a few more. But I humbly affirm, they have all been mistaken in under-reckoning. And the Reason of their Mistake seems to have been, their reckoning only by the Maps; that is by computed, and not by measured Miles; by which only the Number of Acres can be known. I have seen an Account of the Number of Acres in each County: Which Account, whether taken from Dooks-Day Book, or from any other Registry, cannot be true. For though we have lost some Land, yet there is a great deal more now gained, which in the Conqueror's time lay under Sea. Within 120 Years, very much has been recovered out of the Seas, and maintained by Banks, in the Marshes and Fenns of *Essex*, *Kent*, and the Isle of *Ely*. And in some Parts of *Lincolnshire*, the Land has gained of the Sea, four Miles in a direct Line from Land to Sea, in Memory of Men now living. Nor is it the truer for having been taken from any other Record: For if the Numbers of Acres, according to the said Account in each Shire, be put together, they exceed not thirty nine Millions and a Quarter: Which Number, though it comes much nearer to the Truth than any of the former, yet is a great deal short of it. For however, according to vulgar Computation, *England*, or *South Britain*, is reckon'd in Length but 305 Miles; and in Breadth about 290 Miles: Nevertheless it appears by an exact Wheel-Measure, That from New Haven, in the South of *England*, to London are fifty six measured Miles; and from thence by a strait Line continued to *Berwick* in the North are 339 of the same measured Miles; in all 395 measured Miles, the true Length of *England*. And again, that from the South

*Of the Number of Acres contained in England, by Dr. Grew, n. 330. p. 266.*



Foreland in the *East*, to the Lands-End in *Cornwall*, are about 367 Miles of the same Wheel-Measure, the true Breadth of *England*.

This being known, it is easy without any laborious and costly Survey, to know also how many Square Miles, and consequently how many Acres are contained in *England*, or *Great Britain*; to wit, in the following manner.

Plate 17.  
Fig. 1.

If a Line be draw on a Chart of *England*, from the South Foreland in *Kent* to *Berwick*; and from the two Ends of this Line, two more Lines meeting at the Lands-End in *Cornwal*, they will make the Triangle A B C: Which Triangle, in that it excludeth as much more of the Land, as it includeth of the Sea, as may answer the small Number of Miles obtained by the Curvity of the Roads; it may therefore be allow'd to be equal to the *Area* of *England* or *South Britain*. Next, if to the Triangle A B C, another similar and equal Triangle B C D be added; both together make the Rhomboid A B D C. Which being divided at E F, maketh the Rhomboids A C E F, and B D E F, equal one to the other. One of which is therefore equal to the Triangle A B C. And the Rectangle A G H F, standing upon the same Base, and between the same Parallel Lines with the Rhomboid A C E F, by the 35<sup>th</sup> of the 1<sup>st</sup> of *Euclid*, is equal to the said A C E F: equal to the Triangle A B C: equal to the *Area* of *England*, or *South Britain*. Now the Length between *Berwick* and the South Foreland in *Kent*, being about five Miles more than between *Berwick* and *New Haven*, which is 395 Miles: Therefore the Line A B may be taken for 400 Miles; and so the Line A F for 200. And the Line A G being less by about seven Miles, than between the South Foreland in *Kent*, and the Lands-End in *Cornwall*, which is 367 Miles, the said A G may be taken for 360 Miles. Therefore A G, 360, being multiply'd by A F, 200, produceth 72000 Square Miles: And 72000 being multiply'd by 640, the Number of Acres contained in one Square Mile, produceth forty six Millions and 80000, the Number of Acres contained in *England*, or *South Britain*.

Whence it appears, First, that if the Province of *Holland* contains, as is computed, but one Million of Acres, then *England* is more, by a Fraction of 80000 Acres, than forty six times as big as *Holland*. Next, if in the Province of *Holland*, containing but one Million of Acres, are two Millions and 400 Thousand Souls, or two Millions and four tenths, as they are said to be; then *England*, which contains forty six Millions of Acres, to be proportionably populous, should have twice forty six Millions of People, and four tenths of forty six; that is about 110 Millions.

But to allow room enough for Persons of all Degrees under our *British* Monarchy, if *England* were half as populous as *Holland*, with only fifty five Millions, it were a good Proportion, and would be near five times our present Number: And about twenty two times as many, as in the Province of *Holland*. To people *England* in a competent time, with this Number; there are sundry ways very practicable. By which, I have  
computed



computed, the present Number may be doubled in twenty four or twenty five Years. And probably quadrupled in about thirty six Years.

IX. Let *S. T.* represent Part of the Ridge of an Hill, gradually rising from *S* to *T*, for near half a Mile; and *S. T. W. U.* the North Side of the Hill, with a Declivity from *S.* to *U.* and from *T.* to *W.* The Perpendicular Height at *X.* to the Plain of the Bottom at *Y.* 150 Feet, and the Slope Line or *Hypotenuse X. Y.* 630 Feet. The Declivity pretty uniform from *X.* to *L.* and from *L.* to *Y.* considerably steeper: The Bank *A. E. F. D.* overgrown with shrubby Wood: All the Ground on the Side of the Hill being firm, green, and arable; of a mix'd Soil, Clay and Gravel, but more Clayey.

*Of the Subsiding of Part of a Hill near Clogher in Ireland, communicated by the Bishop of Clogher, n. 337. p. 267. Plate 17. Fig. 2.*

On *Tuesday* the 10<sup>th</sup> of *March*, 1712-13. in the Morning, the People observ'd a Crack in the Ground like a Furrow made with a Plough, going round from *A.* by *B. C.* to *D.* They imputed this to (what they call) a Thunderbolt; because there had been Thunder and Lightning on *Monday* Night. But on *Tuesday* Evening an hideous dull Noise raised their Curiosity; and they observ'd that the whole Space *A. B. C. D.* containing about three *Irish* (i. e.  $4\frac{3}{4}$  *English*) Acres, had been all Day in a gentle Motion: And the Noise continued all Night, occasion'd by the rubbing of Bushes, tearing of Roots, rending and tumbling of Earth. The Motion ceas'd on *Wednesday* After-noon; when they saw the Bushes on the Bank *E. F.* were remov'd, some standing and some overthrown, to the plain Meadow *Y. y.* The green Ground above *E. F.* when it came to the Top of the steep Part at *E. F.* rent with hideous Chasms, ten, fifteen or twenty Feet deep, and tumbled down in Rolls of a Yard or two thick, and ten or twenty long and broad; not unlike a smooth Water breaking over a Cataract, and tumbling in Waves below.

There was a Precipice at the Top *X. x.* sixty five Feet perpendicular, making the Slope Line *X. x.* 126 Feet. The Ground from *x.* to *L.* was made more level, the whole perpendicular Height of *x.* not exceeding the Plain of *L.* above thirty Feet; but the Ground at *L.* in the whole Line from *E.* to *F.* was mounted above twenty Feet higher than the unmoved Ground on either Side at *E.* and *F.* and the Height of *L.* above the Plain of *y.* is fifty five Feet. There was a Ditch *H. I.* went cross the Ground; which being broken off at *o. o.* is removed together with the moving Part thirty four Feet lower down than the immoveable; but at the Bottom *y.* it is tumbled sixty Feet over the plain Meadow. The Breadth at the Bottom *a. b.* is 400 Feet, and at *c. d.* about 300. The whole Face of the Precipice *X. x.* is of a blue Clay, mix'd with many little blue Stones. The Metal is very hard when dry; but upon any Rain softens to a kind of Mortar, without the Degree of Toughness and Stiffness that is natural to Clays. It is very much like that Gravel or Sand (as they call it) which is somewhat of a grey marly Nature, and with which of late they do much improve the plow'd Land in this Country.



About  $x$ . there are Chasms or Gapings full of Water, which make a Rill down the *Hiatus B. E. A.* but in no greater quantity than might have been expected from a Well sunk to a less depth. Though I was told that there were Holes in the higher Mountains, that received Water under-ground; yet I can find no such thing, nor any Symptoms of a Current under-ground, either where it enters or rises, in all the neighbouring Ground for some Miles. It seems to me that there has been no Vacuity under-ground to receive the subsiding Earth; for what the Bank *E. L. F.* is raised higher, and what is tumbled down to the plain *a. b.* may very well compensate the Subsiding at the Precipice *X. x*.

Before the Rupture the Declivity from *X.* to *L.* was not altogether uniform, but was hollower where  $x$ . is now, than the adjacent Parts: It might have been, by the Description I have from the People, ten Feet deep in the middle, and one hundred Feet diameter; and they have a Tradition, that this was made by a Subsiding before the Forty One Wars, (the oldest *Epocha* the Country *Irish* know.) The Neighbours impute it to the great and constant Rains we have had last Harvest and Winter, which have soak'd and steep'd all the Ground.

An uncommon  
sinking of the  
Earth, near  
Folkestone in  
Kent, by Mr.  
Sackett. n.  
349. p. 469.  
Plate 17.  
Fig. 3.

*X.* The Figure describes a strait Road from what we call the *Mooring-Rock*, to *Tarlingham-House*; the manner of the Country as to the Rising and Falling, being much the same, for about a Mile on either hand of the Road described:

*A.* The *Mooring-Rock*, about half-way between high and low Water-mark. *B.* The Foot of the Cliff, fifty Yards from the Rock. *C.* The Top of the Cliff, about six Yards high. *CD.* A Plain of fifty Yards. *DE.* A cragged Cliff, of sixty Yards high. *EF.* A Plain above a Mile long. *FG.* An Hill of steep Ascent, near half a Mile. *GH.* The Land from the Top of the Hill to the House, near a Mile. *I.* *Tarlingham-House*, lying near two Miles and an half *N. N. W.* from the Rock. *EGH.* A Line of Sight. *KBL.* The Shore at High Water-mark.

The *Mooring-Rock* (tho' it lies surrounded with great Numbers of other Rocks) is it self a most noted one, known by this Name, time out of mind. At this Vessels use to be moored, while they are loading other Rocks; which they take from hence, not only for our own *Pier-Heads*, but for those of *Dover-Pier*; and a very great Quantity of them were ship'd, in the Time of *Oliver's* Usurpation, and carried to *Dunkirk*, for the Service of that Harbour. The Rock has remain'd fix'd thus, for the Memory of Man; and old Men have observed, that, for forty Years and upwards, the distance between it and the Foot of the lesser Cliff *AB.* has been much the same; neither can they be much out in their Guess, the Distance being so small. Tho' there seems nothing extraordinary in this, yet its what they take special Notice of, to their great surprize: for they say, and prove by good Marks and Tokens, that the lesser Cliff *BC.* has been constantly falling in, insomuch, that

from



from time to time, in their Memory, near ten Rods forward to the Land has been carried away by the Sea. From whence, as it appears, that the Plain between the Top of the lesser Cliff and the Foot of the higher *C D*. has been formerly double the Breadth that it is at present, so the distance between the Rock and the Foot of the lesser and lower Cliff *A B*. should have increased in proportion, and would have been double at present, to what it has been formerly: But this Distance remaining the same (as is above noted) or rather less (in the Opinion of many) is what is greatly wonder'd at: nor can it be accounted for otherwise, than by supposing that the Land pressing forward into the Sea is washed away by the high Tides; and, as often as this happens, presses forward again. This pressing forward of the Land into the Sea, would be incredible, were it not shewn to be matter of Fact; and that not only at this one place of Observation, but by like Observations all along this Coast, as far as the Situation continues the same.

Now, let us climb both these cragg'd Cliffs, and place our selves at the top of the higher one, at the Point *E*. And here we are to observe, that (as old Men inform us) upward of forty Years ago, not so much as the Top of *Tarlingham-House* could be discern'd, neither from hence, nor yet a good distance off at the Sea; but it discovered it self by degrees, till at this Day, not only the whole House, but a great Tract of Land below it, is plainly to be seen, as in the Line of Sight *E G H*. The Tract of Land is more in proportion than describ'd in the Sketch, between the Point at *H* and the House. In this there can be no Fallacy; and we can ascribe it to nothing less than the sinking of the Hills (for their Tops could never wear away considerably, being always cover'd with Grass, and never broken up by the Plough or otherwise). These Hills are all of Chalk, and have probably very large Caverns within, Springs of Water always flowing plentifully from the Foot of them; and I have had it observ'd to me, that upon their Tops frequent Cracks have been taken notice of. Whatever be the Cause of it, 'tis not to be doubted but that these Hills are greatly sunk. And this sinking of the Hills, the People at this Place believe, forces the Cliffs and all the Land forward into the Sea. The Cliffs consist of great ragged Sand-Stones till we come to near a Yard (at some places more) of the Bottom; then we meet with what they call a *Slipe*, *i. e.* a slippery sort of Clay always wet. Upon this *Slipe* at the Bottom, they presume that the hard stony Land above slides forwards toward the Sea, as a Ship is launch'd upon tallow'd Planks. This Relation is attested under the Hands of several ancient and credible Persons.

XI. By searching into our own Antiquities, we may be furnish'd with Instances of the Frequency of this Distemper among us, in all its respective Stages, before ever our modern Authors dream it had its Appearance in *Europe*. I shall begin with the first Degree of this Disease, and prove from authentick Evidences, it was anciently call'd the *Brenning* or *Burning*;

*Of the Antiquity of the Venereal Disease, by Mr. Will. Beckett. n. 357. p. 839.*



**Burning**; and that this Word has been successively continu'd for many Hundreds of Years, to signify the same Disease we now call a *Clap*; and that it was not discontinu'd till that Appellation first began to have its Rise. The most likely Method to accomplish my Design, will be first to examine those Records that relate to the *Stews*, which were by Authority allowed to be kept on the *Bank-Side* in *Southwark*, under the Jurisdiction of the Bishop of *Winchester*, and which were suppressed the 37th of *Henry VIII.* For its impossible, but if there were any such Distemper in being at that Time, it must be pretty common among those lewd Women who had a Licence for entertaining their Paramours, notwithstanding any Rules or Orders which might be establish'd to prevent its Increase: But if we shall find that there were Orders establish'd to prevent the Spreading of such a Disease, that Persons might be secure from any contagious Malady after their Entertainment at those Houses (which were anciently eighteen in Number, but in the Reign of *Henry VII.* reduced to twelve) we may then securely depend upon it, that it was the Frequency of the Disease that put those that had the Authority, under a necessity of making such Rules and Orders. For the same Powers that granted a Liberty for keeping open such lewd Houses, must find it their Interest to secure, as much as possible, all Persons from receiving any Injury there; lest the Frequency of such Misfortunes should deter others from frequenting them, and so the original Design of their Institution cease; from the entire sinking of the Revenues. Now I find that, as early as the Year 1162, divers Constitutions relating to the Lordship of *Winchester*, (being also confirmed by the King) were to be kept for ever, according to the old Customs that had been time out of mind. Among which these were some, *viz.* No *Stew-holder* to take more for a Woman's Chamber in the Week than 14*d.* Not to keep open his Doors upon Holy Days. No single Woman to be kept against her Will, that would leave her Sin. No single Woman to take Money to lie with any Man, except she lie with him all Night till the Morning. No *Stew-holder* to keep any Woman that hath the perilous Infirmary of **Burning**. These and many more Orders were to be strictly observed, or the Offenders to be severely punished. Now we are assured there is no other Disease that can be communicated by carnal Conversation with Women, but that which is Venereal, by reason that only is contagious; and its evident the **Burning** was certainly so: For, had it been nothing else but some simple Ulceration, Heat, or Inflammation, there would have been no Contagion; and that affecting only the Woman, could not be communicated by any Venereal Congress, and so not infer a Necessity of her being comprehended under the restraining Article. These Orders likewise prove the Disease was much more ancient than the Date above-mentioned; because they were only a Renewal such as had been before established time of mind.



But to confirm this farther, I find that in the Custody of the Bishop of *Winchester*, whose Palace was situated on the *Bank-Side* near the *Stews*, was a Book written upon Vellum, the Title of which runs thus; *Here be- gynne the Ordinances, Rules, and Customes, as well for the Sal- vation of Mannes Lit, as for to aschew many Mychies and In- convenientes that dayley be lik there for to fall owte to be rightfully kept, and due Execution of them to be don unto any Personne wythin the same.* One of these Articles begins thus; *De his qui custo- diunt Mulieres habentes Nephendam infirmitatem.* It goes on, *Item, That no Stew-holder keep noo Woman wythin his Hous that hath any Sicknesse of B R E N N I N G, but that she be putte out upon the peyne of make it a fyne unto the Lord of a hundred Shyllings.* This is taken from the original Manuscript which was preserv'd in the Bishop's Court, suppos'd to be written about the Year 1430. From these Orders we may observe the Frequency of the Distemper at that Time; which, with other Inconveniences, was *dayley lik there for to fall owte*; and the Greatness of the Penalty, as the Value of Money then was, that is laid on it, proves it was no trifling or insignificant thing.

But the bare Proof of there having been anciently such a Disease as was called the *Burning*, may be thought to be insufficient, unless we were perfectly assured what it was, and how it was in those Times de- scribed: I shall therefore do it from an unquestionable Authority, which is that of *John Arden*, Esq; who was one of the Surgeons to our King *Richard II.* and likewise to King *Henry IV.* In a curious Manuscript of his upon Vellum, he defines it to be, a certain inward Heat and Excoria- tion of the *Urethra*; which Description gives us a perfect Idea of what we now call a *Clap*; for frequent Dissections of those that laboured un- der that Disease, have made it evident, that their *Urethra* is excoriated by the Virulency of the Matter they receive from the infected Woman; and this Excoriation or Ulceration is not confined to the *Ostiola* or Mouths of the *Glandulæ Muscosæ*, as has been lately thought, but may equally alike attack any part of the *Urethra* not beyond the reach of the impelled malignant Matter. The Heat before described, which these Persons are sensible of, as well now as formerly, is a consequent of the excoriated *Urethra*; for the Salts contained in the Urine must necessari- ly prick and irritate the nervous *Fibrillæ*, and excite a Heat in those Parts of the *Urethra* which are divested of its natural Membrane; which Heat will always be observed to be more or less, as the Salts are diluted with a greater or less Quantity of Urine; a thing I have often observed in Persons that have laboured under this Infirmary in hot Weather, when the perspirable Matter being thrown off in greater Quantities, the Salts bear a greater Proportion to the Quantity of Urine, and thereby make its Discharge at that Time so much the more painful and troublesome.

Thus we see this very early and plain Description of this Disease a- mong us, to be entirely conformable to the latest and most exact anatomi-



mical Discoveries. Here is no Tone of the *Testicles* depraved, according to *Trajanus Petronius*; no Exulceration of the *Parastatæ*, according to *Rondeletius*; no Ulceration of the *Seminal Vessels*, according to *Platerus*; no Seat of the Disease in the *Vesiculæ Seminales* or *Prostatæ*, according to *Bartholin*; nor in those Parts and the *Testicles* at the same time, according to our Countryman *Wharton* and others, who have falsely fixed the Seat of this Disease, and whose Notions, in this respect, are now justly exploded; but a single and true Description of it, and its Situation, about an hundred and fifty Years before any of those Gentlemen wrote.

Having, I hope, sufficiently made it appear the **Burning** was a Disease very early among us, and given the Description of it, I shall proceed to say something of the ancient Method that was made use of to cure it. We are not to expect the Measures of our Predecessors, in those early Times made use of, should be calculated for the removing any Malignity in the Mass of Blood, or other Juices, according to the Practice in Venereal Cases at this time; because they looked upon the Disease to be entirely local, and the Whole of the Cure to depend upon the Removal of the Symptoms: Hence 'twas they recommended such Remedies as were accommodated to the taking off the inward Heat of the Part, and cure the Excoriations or Ulcerations of the *Urethra*. The Process for the accomplishing of this, I shall set down from the before-mentioned *John Arden*, who wrote about the Year 1380. his Words are as follow, *Contra Incendium. Item contra incendium Virgæ Virilis interius ex calore & excoriatione, fiat talis Syringa (i. e. injectio) lenitiva. Accipe Lac mulieris masculinum nutrientis, & parum zucarium, Oleum violæ & ptisanæ, quibus commixtis per Syringam infundatur, & si prædictis admiscueris lac Amygdalarum melior erit medicina.* There is no doubt but this Remedy, being used to our Patients at this time, would infallibly take off the inward Heat of the Part, and cure the Excoriations or Ulcerations of the *Urethra*, by which means what issued from thence would be entirely stopt; and this was all they expected from their Medicines, forasmuch as they were entirely unacquainted with the Nature of the Distemper; and did not in the least imagine, but if the Symptoms that first attack'd the Part were removed, the Patient was entirely cured.

I shall now prove, that by this **Brenning** or **Burning** is meant the Venereal Disease, by demonstrating that succeeding Historians, Physical and Chirurgical Writers, and others, have all along with us in *England* used the very same Word to signify the Venereal Malady. In an old Manuscript I have by me, written about the Year 1390. is a Receipt for **Brenning of the pyntyl, yat men clepe ye Apegaille**; **Galle** being an old *English* Word for a running Sore. They who know the *Etymology* of the Word *Apron*, cannot be ignorant of this. And in another Manuscript, written about fifty Years after, is a Receipt for **Burning** in that Part by a Woman. *Simon Fish*, a zealous Promoter of the Reformation in the Reign of *Hen. VIII.* in his Supplication of Beggars, presented to the King in



in 1530. says as follows, *These be they* (speaking of the *Romish Priests*) *that corrupt the whole Generation of Mankind in your Realm, that catch the Pocks of one Woman and bear them to another; that be Burnt with one Woman and bare it to another; that catch the Lepry of one Woman and bare it unto another.* But to make this Matter still more evident, I am to observe, that\* *Andrew Boord*, a Doctor in Physick, and *Romish Priest*, in the Reign of *Hen. VIII.* speaks very particularly of this sort of Burning; one of his Chapters beginneth thus, **The 19<sup>th</sup> Chapter doth shew of BURNING of an Harlotte**; where his Notion of communicating the *Burning* is very particular. The same Author adds, that if a Man be **Burnt** with an *Harlot*, and do meddle with another Woman within a Day, he shall **Burn** the Woman that he shall meddle withal; and as an immediate Remedy against the **Burning**, he recommends the washing the *Pudenda* two or three times with White Wine, or else with Sack and Water; but if the Matter have continued long, to go to an expert Chirurgeon to have Help. In his 82<sup>d</sup> Chapter, he speaks of two sorts of Burning, the One by Fire, and the Other by a Woman through carnal Copulation, and refers the Person that is **Burnt** of a *Harlot* to another Chapter of his for Advice, what to do, *ys he get a Doyser or two*, so called from its Protuberancy or bunching out: For I find about that time the Word *Bubo* was mostly made use of, to signify that sort of Swelling which usually happens in pestilential Diseases. From hence it appears, the *Burning*, by its Consequents, was *venereal*, since every Day's Experience makes it evident, that the ill Treatment of the first Symptoms of the Disease, either by astringent Medicines, or the removing them by cooling and healing the excoriated Parts, will generally be attended with such Swellings in the Groin, which we rarely observe to happen from any other Cause whatsoever.

\* *The Breviary of Health, printed in 1546.*

I shall give a few more Instances of this Disease being call'd the *Burning*, and conclude. In a Manuscript I have of the Vocation of *John Bale* to the Bishoprick of *Ossory* in *Ireland*, written by himself, he speaks of *Dr. Hugh Weston* (who was Dean of *Windsor* in 1556. but deprived by *Cardinal Pole* for Adultery) as follows, "At this Day is lecherous *Weston*, "who is more practised in the Art of **Brech Burning** than all the "Whores of the *Stews*. And again, speaking of the same Person, he says, "He not long ago **hent** a *Beggar* in *St. Botolph's* Parish." The same Author says of him elsewhere, "He had been sore bitten with a "Winchester-Goose, and was not yet healed thereof;" which was a common Phrase for the Pox at that time, because the *Stews* were under the Jurisdiction of the Bishop of *Winchester*. *Mick. Wood* in his Epistle before *Steph. Gardiner's* Oration *De vera obedientia*, printed at *Rhoan* in 1553. gives another Evidence of the **Burning**. And in 1562. *William Boylen*, bringing in *Sickness* demanding of *Health*, what he should do with a Disease call'd the *French Pockes*. *Health* answers, that he would not that any should fishe for this Disease, to be bold when he is bitten, to thynke



thereby to be help'd, but rather to eschewe the Cause of thys Infyrmity, filthy rotten **Burning** of Harlots.

Microscopical  
Observations  
by Mr. J. W.  
Wilson,  
n. 281 p. 1247.  
Plate 17.  
Fig. 3.

XII. 1. A, B, C, D, E, F represent the Feathers of the Wings of Butterflies and Moths; A, B, are the same, but differently magnified. A, was express'd by the 4th Glass by one of my Microscopes, and B, as it appear'd by the first. The rest, being taken from different parts of those Insects, C, D, E, F, were all viewed by the 4th Glass.

G is one grain of the *farina* of the *capillaments* of Maloes, by the first Glass. H, H, is the Tail of a small Fish, viewed when living by the 4th Glass, i i i i is the part of the Tail next to the Body of the Fish, where the Trunks of the *Veins* and *Arteries* pass together. I I I I their extremities, which appear united. k k k other inosculation, with the *Arteries* and *Veins* appearing in the transparent Membrane, between the Cartilages K K. L L L L the Cartilages composed of several Joynts, on each side of which the Trunk of a Vein and Artery passes. M an *animalculum*, whereof a great number appeared moving themselves up and down on the Tail of the Fish, while the *Circulation* was a viewing. N a side view of the same *animalculum*. O another *animalculum* of a different figure from the former, that stuck to the Tail of the Fish by its jagged extremity, and frequently drew its long Body out and in again. P Q one of the Lice found on that Beetle, called *Scarabeus Pediculofus* by the 4th Glass. P its *Anus*. Q its two Claws, not unlike those of a Lobster. r r r r the extremities of its Feet, which have a remarkable contrivance for sticking fast to the polish'd surface of the Beetle, not in the manner of Claws, as many other Insects; but divided into Capillaments, as expressed in the Figure.

by ———  
n. 284.  
p. 1357.

2. In a living *Louse*, I could plainly see the motion of the Muscles (when he stirr'd his Legs) all which are joyned in a longish dark spot in the middle of his Breast, where the Tendons seem all united. The like motion of Muscles is also visible in the head when he stirs his horns, and in the several Articulations of his Legs. I saw also clearly a multitude of various branchings of Arteries and Veins, and the Pulse regularly beating in several Arteries. But the most entertaining sight is the *Peristaltick motion* of the Intestines, which is continued from the Stomach thro' all the Guts to the *Anus*. I have observed the like *Peristaltick motion* in a Flea, and in several sorts of small transparent Maggots and Caterpillars. But a *Louse* is easiest to be had in all Seasons, and will bear rougher handling, and live confined between two concave plates, if not crushed, 4 or 5 days.

Plate 18.

I thought a *Mite* would also prove a good subject for the like purpose, but found them not so transparent as I expected. However I plainly saw that all the bristles on the body of one of them (which to a common single Glass, and to the greatest Magnifier of my three glassed Microscope look like plain smooth hairs) were when viewed with a large Augmenter all spiculated (if I may make a word) or bearded like the Ear on the Seed head of some Grasses. The appearance was like the annexed figure, which shews

Fig. A.



Fig. 1.



Fig. 5.



Fig. 3. P. 244

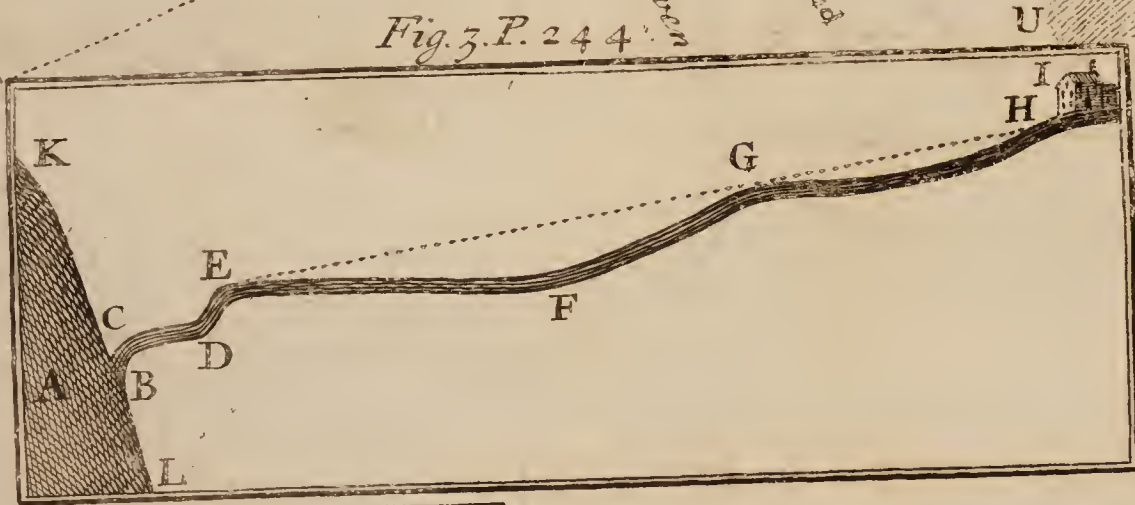


Fig. 3. P. 250.

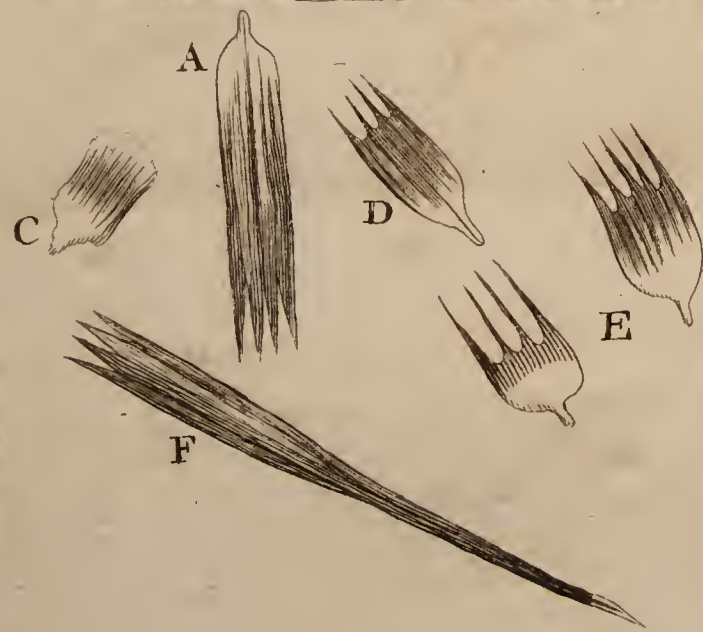
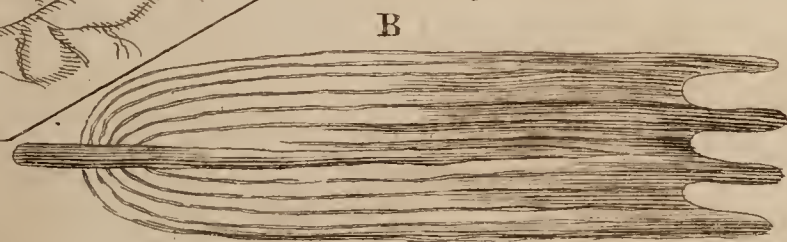


Fig. 2.



Fig. 3. 250. P.











*[Faint, illegible handwritten text covering the majority of the page, likely bleed-through from the reverse side.]*



Fig. A.



Fig. E.

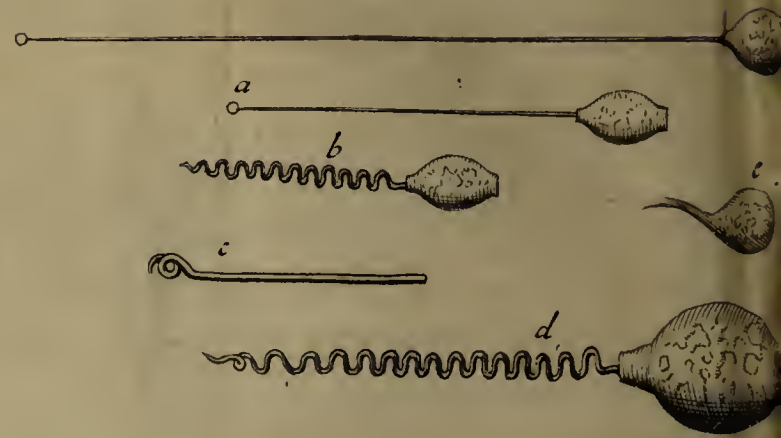


Fig. B.

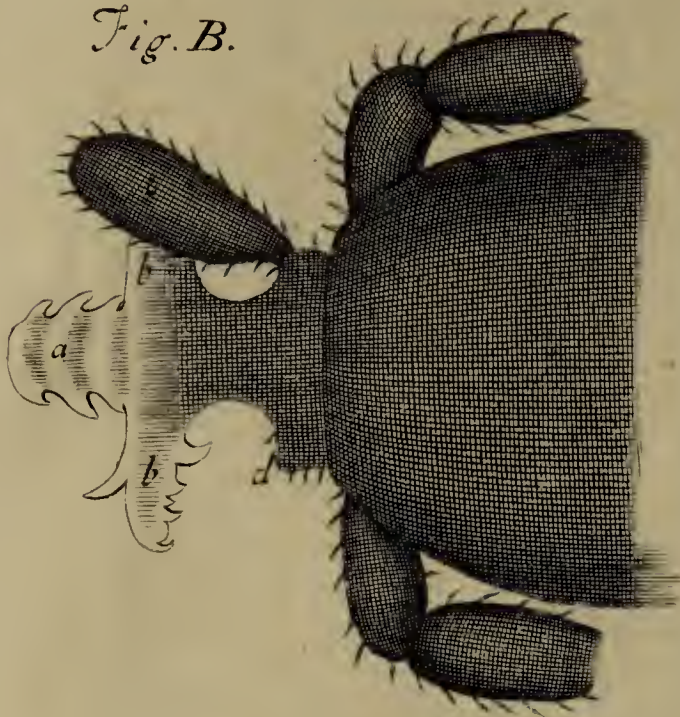


Fig. F.



Fig. H.



Fig. G.

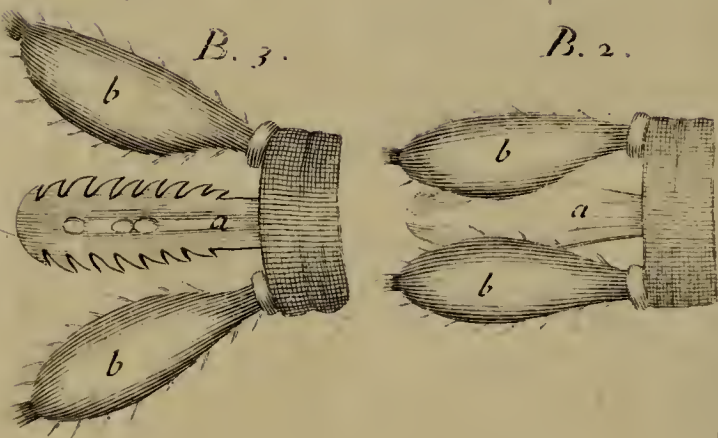


Fig. L.

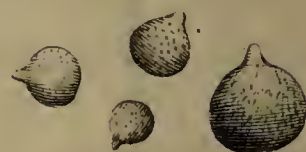


Fig. K.



Fig. C.

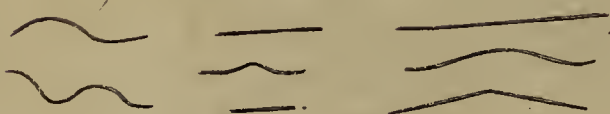


Fig. D.



Fig. M.

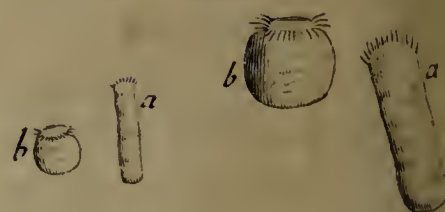


Fig. N.





part of the bristle, but I cannot express the beauty and regularity of it, and every bristle on the whole Body and Legs, both long and short, had the same formation. But I must tell you withal, that all Mites are not so, for of 7 or 8 inclosed together, I found but one whose bristles were of this make, in the rest the horns only were spicated. Whether they were of different kinds, or rather only of different Sexes, I shall not determine, they were all taken out of the same Cheese at the same time, and were in other parts very like. Their Mouths open Horizontally (to the right and left) like that of a Wasp, and hard headed Maggot, and after their being some days shut up together I found some dead, and the Survivors preying on them, which gave me an opportunity of observing their manner of feeding, which was very remarkable, for they thrust one mandible forward, and bring the other backward at the same time, and this alternately, and by that means seems to grind their food. If you should bring one of the greatest Magnifiers to observe a Mite or the like minute Animal, you must lay him on a thin Muscovy Plate in one of the Sliders, and cover him with a Concave, and take good care not to crush the Object between the Plates in your approach.

2. I pull'd off an handful of *Muscles*, which stuck on a piece of a Rock that was covered by the Sea every Tide. These I brought with me that I might observe the Organs by which they fix themselves so firmly to a Stone, that even a Storm will not wash them off. I found that these were threads which came from that part which is called the Beard of the Muscle, which had on their extremity, a flat spongy substance, that adhered only by imposition, like the wet pieces of Leather which Boys fasten to Stones, and they are describ'd, and well pictured by Mr. *Leeuwenhoeck*. But my principal end in gathering these Muscles was, that I might view and examine the Inhabitants of those little white Shells, which stick like Pustules on Muscle-shells, (as they do likewise on Lobsters, Oysters, Stones, &c.) Mr. L's Draught is very accurate, only that in the 12 long Branches growing from the Head, the bristles are there pictured coming out quite round on each joynt of every Branch, whereas they grow only on the inside, (all the hind part being perfectly bare) and look not unlike a ruffled Feather stript on one side. I cannot guess at the use of these curious ramifications, unless they serve to draw in food to the Creature, which cannot move out of its place. For keeping them alive in Sea-water, I saw them often put them out thro' the slit of the *Operculum* which closes the top of the Shell, and draw them in again. This as I remember the Naturalists call a *Balanus* and class it with the *Concha Anatifera*. I never saw the latter, but that being much larger, if (as 'tis probable) it has the like Organs, we may easily account for the mistake of even some observing Men, who affirm they have seen them Feathered, and think them Birds *in fieri*. Some of the Muscles which I brought were little above a quarter of an Inch long. I took one of these out of the Shell, and exposed it to the Microscope on a thin Plate of Muscovy Glass, and holding it to



the light of a Candle, I saw in the thinner parts a vast number of Veins and Arteries, and the Blood circulating in them more distinctly than I ever saw it in any other Animal. For I had this advantage in the Observation, that the Object lay always quiet, without changing Place, and my Plate was so thin, that I could bring to it what Magnifiers I pleased, and look without disturbance as long as I pleased; for whereas other Animals will not easily be brought to lye still any considerable time, and will not live long when exposed to a Microscope, this lay always in the posture it was placed, and the motion of the Blood continued with little alteration 6 or 7 hours, only by keeping the Object moistened with Sea-water, and might have lasted much longer if I had not thrown it away. I repeated the same Experiment for 2 or 3 days with some of the remaining Muscles, with little difference in the Success.

The other day I spied running among some Fruit, a small Worm which I could perceive to have a multitude of Legs, it was not half an Inch long, and the Body not thicker than an Hog's Bristle. This I put alive into a small Tube, and found it a perfect *Scolopendra*, whose Body was made up of 60 Incisures, at every one of which was a pair of Legs (one on each side) and each Leg had five Articulations. On his Head were 2 Horns, each of 16 Joints, and under it a pair of terrible Forcipes, red, crooked, and pointed like the Talons of an Hawk, and I often saw him open and shut them, and wipe his Horns thro' them. These Forcipes are not unlike, and probably for the same Use as those on the Head of a Spider, but they are difficultly seen (because generally kept close) in a living Spider, but you may readily find them open'd, and in their perfect Shape, in the Spider's *Exuvie*, or cast Coats.

Fig. B.

I found a small black flat *Tick*, (after walking in a Thicket) sticking on my Arm, and it had got its forepart so far into the Skin, that I had much ado to separate it with the point of a Needle, so as to preserve it intire and unhurt. I observed the Snout of this to be shaped not very unlike the jagged *Proboscis* of the *Serra Piscis*. The forepart of it *a* being like the end of a broad-pointed Sword, is clear and transparent, and has 3 Teeth on each edge, below which there comes out another serrated part *b b* on each side almost at right Angles; but this is partly hid (when you look on the Back) by a thick Horn *c* on the side of the Head. I broke off one of the Horns at *d*, and then it appeared as in the annexed Figure, which represents the fore part of this *Tick*. I afterward examin'd the Snouts or *Proboscis* of *Dog Ticks*, to see if they had the like Conformation, and found their Appearance as in *Fig. B 2*. the Snout *a* being so covered by the two clumsy thick Horns *b b* that the serrated Edges could not be perceived, but separating the Horns (with some difficulty) they appeared in the Posture of *Fig. B 3*. and I could then plainly see 8 Teeth or Jaggs on each side, as here expressed, but the Snout of a *Dog Tick* has not the additional serrated part, which is in the *Wood Tick*. I could also perceive

a Pipe



a Pipe or Channel run through the Snout, and see some Bubbles move up and down in it, which I have also endeavoured to represent.

3. I have found some of the *Animalcula* in Pepper Water, almost incredibly minute, which appear even to my greatest Magnifiers not so large as a Mite to a naked Eye, and in the bigger sort, I can plainly see the little Feet by which they perform so brisk Motions, which I never could find before. But I doubt not but your own Microscopes had shew'd you what is discoverable in these Liquors, and therefore I shall say no more of them. Only I cannot omit mentioning one sort of Animal in them, which I never discover'd till within these 3 or 4 days. These are very slender long Worms, of which my Pepper-water is prodigiously full. They are all of the same thickness, but their lengths are very different, some being twice, and some thrice as long as others, and at a Medium I judge the Proportion of their length to their breadth at least as 50 to 1. Even to the largest Magnifiers they look like Shreds of Horse-hair (to a naked Eye) from a quarter to 3 quarters of an Inch long. Upon a modest Estimate their thickness is not the 100th part of an hairs breadth, and consequently if you imagine an hair of your Head split into above 7800 equal Fibres, each Fibre would be as thick as one of these Creatures. Their Motion is equable and slow, and generally they wave their Bodies but little in their Progression, tho' sometimes they make greater Undulations. But what is more remarkable, they swim with the same Facility both backward and forward, so that I cannot distinguish at which end the Head is, and I have seen the same Worm go forward with one end, and back again with the other end foremost above 20 times together. And sometimes they will (like Leeches) fix one end on the glass plate (on which I lay the Water) and move the loose part of their Body round about very oddly. These I take leave to call *Capillary Eels*, and I have given you as well as I could a representation of their Appearance to a great Magnifier, in the several Postures I have seen them swim. I find the Dust of the *Fungus Pulverulentus* or *Puff-Ball* to be the minutest Powder that I ever saw: To a naked Eye you know (when 'tis crush'd) it appears like a Smoke or Vapour, and with a common Microscope you cannot distinguish the Particles. But when 'tis viewed with the greatest magnifiers, each grain is visible and exactly alike, and appears a perfect spherule of an Orange colour, something transparent, whose axis is not above the 50th part of the Diameter of an Hair. So that a Cubical Vessel of an Hairs breadth of a side, would hold 125000 of them. This was the dust of that *Fungus* which is bigger than your two Hands put together, and I observed since in another Puff Ball of the size of a small Crab (which I take to be a different kind) that all the Globules were darker, and that every one had a little Tail or Stalk affixed to it. I at first imagin'd that these (tho' so minute) might be Seeds, but was soon cured of that fancy when I found that the smut of Corn was composed of the like regular Globules, and about the same size. My way of observing these and the like dusts, is to breath gently on a thin Muscovy



Muscovy Plate, and then covering it highly with the Powder, to blow it off again, for enough will adhere, and they should not lie in confusion.

4. A *Buck* which by mischance had his Leg broke, was kill'd, and it being rutting time I thought I might with the greatest advantage observe the *Semen Masculum*. As soon as he was killed I took out one of the *Testicles* with the adjoining *Seminal Vessels*, and found the *Vasa deferentia* very turgid, and full of a milky fluid. After various methods of viewing this Liquor, I saw the *Animalcula*, (in prodigious numbers) very perfectly in several postures moving very briskly, and shew'd them to others, who own'd they appear'd as plain as Tadpoles to a naked Eye. The greatest task was to lay them thin enough before the Microscope, for when the Matter is too thick, you see nothing distinctly, but only a confus'd Motion, and when thin spread it dries immediately, so that you must be very quick with it, or you will lose your Labour. I diluted some of the *Semen* with warm Water, (just so much as would a little change the colour of the Water) and by that means could see them more distinct and separate, even with smaller Magnifiers, and they then kept their shapes long, even till next day when put in a small Tube, but were without motion. To my best Glasses they appeared about the size, and in the postures here represented.

Fig. D.

5. In my Observations of the *Animalcula in Waters* I have many of the same species in the several infusions, and even in Waters that have been exposed (especially at this time of the year) any time without any particular mixture, such as you find in the hollow of a Cabbage-leaf, or on the *Dipsacus*, &c. and I am confident that many of these are the same Creatures under different dresses. For I have noted such a regular process in them, and such a constant order of their appearance, that I am of opinion most of them are the product of the Spawn of some invisible *Volatile Parents*, and generated like Gnats, and many other sorts of Flies, which are bred, and undergo many changes in the Water, before they take wing. But I give this only for a conjecture. Some of them may probably be originally *Water Insects*, or *Fish sui generis*, and are small enough to be raised in Substance or in Spawn, with the Vapours, and again to fall with the Rain, and may grow and breed again in the Water when kept, and this will seem less strange to you, when I assure you that I have seen, and when I am so happy as to wait on you next, will shew you Fishes, some as small as Cheese-mites of different sorts, very wonderfully made, which are of the crustaceous kind, shell'd with many joyns, with very long Horns, fringed Tayls, and have many Legs like Shrimps, curiously made, and that some of these carry their Eggs or Spawn under their Tayls in one Bag, another sort in 2 distinct Bags, and some kinds on the fringes of their Legs like Lobsters. But to confine my self to the *Animalcula* I was speaking of. Those marked *E.* are very common. I have seen the Tayls of some of these 9 or 10 times as long as their Body, (which is about  $\frac{1}{3}$  of an Hairs breadth Diameter) but generally they are 4 or 5 times as long. As they

Fig. E.



they move, they will often twitch up the Tail in the posture as marked at *b*; and this Spring is so strong, as when the Tail is intangled (as generally it is) by the end, they bring back their whole Body by the jerk, and convolution of the Tail, which soon returns to its first straitness. To a good Glass, the end of the Tail seems to have a knob on it as in *a*, and the folding appears as in *b*; but examining it with one of the greatest Magnifiers, I found the knob to be only a close spiral Revolution, like the Worm of a Bottle-Screw, and that the whole Tail, when twitched up, was also a spiral. I have endeavour'd to represent this appearance (to the great Magnifier) in *c* and *d*. I have also seen them sometimes as in *e*. I have farther observ'd, that when these lie still, they thrust out a fringed or bearded Mouth, which they can draw in again, and that a rapid Stream runs constantly toward their fore part, as if they drew in Water; but I rather believe this Current is made by a nimble tremulous motion of some minute Fins or Legs, which my Glasses will not discover.

Those *Animalcula* marked *F*. are also plentiful in all the Waters, and are the largest of all; and I can see them in a good light and position (without any other assistance) with my bare Eye, their length being about the breadth of a Hair. These have a very quick motion, and are perpetually beating about like a Spaniel in a Field, and by their frequent turns and returns, sudden stops, and casting off, seem to be always hunting for Prey. Their Bodies are very thin, that which I take to be the Back being much darker than the other side; and you shall see them frequently turn sometimes one side and sometimes the other toward your Eye, and many times you may see part of each. Their edges are as it were fringed with a multitude of very minute Feet, which are most conspicuous about the Head and hinder Parts, where are also some Bristles longer than the Feet, which shew like a Tail: *a* shews one of these with the Back, and *b* one with the Belly toward you; and in *c* and *d* I have endeavoured to represent it as it often appears in other Postures. I put some short shreds of my Hair into their Water to compare their Magnitudes by, and saw that they could use their Feet in Running as well as Swimming, for they would often stand on an Hair, and go on it forward and backward from end to end, often stooping down, and bending themselves in several Postures. Among these are generally another sort, (but not above  $\frac{1}{3}$  of their size) whose Feet are also very visible; some of them are shaped almost like a Flounder, and others are rounder behind; for by their motions and actions I judge them the same Creatures. These also will stand and run on an Hair, or any filth in the Water; they are marked *a b* Fig. G. I have likewise seen them double as at *e*, and go forward so, like Flies in Copulation. I was surpriz'd at the first view of this, thinking it a single Animal of that shape; but have since often observ'd them both join and separate, and two of them following a third; sometimes

Fig. F.

Fig. G.



times the first, and sometimes the second laying hold of it, and driving off the other.

The little Feet of these Animalcules are most distinguishable when the Water is just drying off; for they being then stranded, cannot change their place; and if you watch that nick of time, one may see them move their Feet very nimbly, and distinguish them some little time after the Water is evaporated.

6. I thought those which I call'd Capillary Eels had been peculiar to Pepper-water, but have since observ'd the same (tho' but few) in some standing Water which drained from an Horse Dunghill. This Liquor was Mum-coloured, and the most pregnant of all that I had ever seen: And it would look incredible, if I should tell you what a prodigious number of all sorts I estimated to be in a quantity of it of the magnitude of a Pepper-corn, for they appeared as thick as Bees in a Swarm, or Ants on an Hillock; so that I was oblig'd to dilute the Water to observe the particular sorts. I found in this not only almost all the *Animalcula* I had seen in the other Infusions, but many sorts which I never met with before. Among them were in great number plenty of those which are represented in *H.* their extreme parts look bright, and the middle dark, and seems beset with Bristles, and their Tail is pointed with a long sprig at its end, their motion is slow and wadling. But the prettiest object was a great number of a kind of Eels, which appear most distinctly when the Water is almost dry, which make brisk shoots, and have a pretty wrigling motion; they are of different lengths, and are about the thickness of what I call Capillary Eels. I have drawn some of them at *K.* with some of the Capillary Eels among them, that you may better judge of their proportions. I preserved some of this Dunghill-water by me seven or eight days, and found the number of these little Eels decreasing every day, till I could hardly find one in it, tho' they were as plentiful as before in the Water newly taken up. And on the contrary, I observed great numbers in the kept Water, which are very scarce in the fresh. Among these is one sort very singular in its shape and motions: its Body is spherical, only a little pointed like a Pear; and it seems very pliable, like a Bladder fill'd with Water, in which are a vast number of dark Particles in confused agitation. Their most remarkable motion is a revolving one; they will turn sometimes above an hundred times, sometimes not half so fast in a minute the same way, and then stop, and turn the contrary way; and all this without moving a Hairs breadth out of their place: They will also go forward, turn and return, and fetch a large compass, with many deviations; and in their progression they always (even in the shortest turns) keep their pointed end foremost, the revolving motion still continuing; and when the Water dries, their Skin breaks, and the enclosed Liquid diffuses. I have given their shapes at *L.* These are of different magnitudes.

There



There is another sort, represented at *M*, in great numbers, which are near as long as the biggest kind formerly mentioned. These have brisk motions, and are very active, and have many feet before very visible. They will often contract, and again lengthen themselves as they swim, but especially when the Water dries, they will shrink themselves up into a globular Figure, and the Feet then stand out, which you may see move very nimbly a considerable time after. These also are of different sizes; *a a* shews them at their length, and *b b* represents them contracted. Fig. M.

I have also given the Figure of another odly made Animal not uncommon among the rest, which is as large as the former, and in its motion (which is very nimble) keeps always the sharp end foremost. I have observed some variety in these (tho' I take them to be of the same species) some of them being clear, and curiously striated from the point to the thick end, others only having a fore part clear, and the Bottle dark, as is shew'd at *a* and *b*, but I cannot by any Glass find the Organs by which they move. I found a curious Mechanism in a small *diving Insect* which inhabits standing Waters. 'Tis like a small fly, with an Head like an House Cricket, but in the place of Wings it has 2 paddles on the Shoulders, and on the end of the hinder Legs, (which are longer than the other 4) instead of Feet and Claws are perfect Oars. I have also taken notice in 2 or 3 sorts of Flies, that behind the Eyes, on the top of the Head, are placed three Protuberances (in Equilateral Triangle with the point foremost) with a black shining Globe in each, like a Ball in a Socket, and are so disposed as if made to look directly backwards. They are perfectly smooth, and without those Hemispherical divisions, visible in the *Cornea* of the Eyes of the Fly and Beetle kind, but appear more like those of a Spider. Fig. N.

I have tried several ways of killing the *Animalcula* before mentioned, by mixing Salts, Spirits and Acids, &c. with their Water, the least touch of which will immediately deprive them of motion and life. But I never yet succeeded in any tryal of recovering or reviving them after the Water was evaporated, by the addition of fresh Water, tho' some have affirmed they may be revived by that means even an hour after, nay some body in one of the Transactions says they will recover after the Water is boiled. Many of those I have mentioned burst when the Water dries, and tho' some keep their shapes a little while, yet they too alter in a few minutes, and I cannot imagine them recoverable.

7. The manner of applying the dry'd Lungs is thus: Take out the Glasses in the Slider or flat piece of Ivory and paste in the Holes part of the dry'd Lungs, as mention'd, whether of Frogs, Toads, Snakes, or the like Creatures, that have their Lungs vesicated as well as vesiculated; by which means you may keep objects of the Lungs of those Animals always by you. Place the external smooth Surface of the Lungs towards your object Glass, when you view it: In the same manner, the Extremities of the Blood Vessels of any transparent Parts of animal Bodies may be examin'd. On the Lungs of Frogs and Lizards. n. 285. p. 1391.



Plate 19.

*Fig. 1.* That part of the 4th Figure at D . . . . done by a larger Magnifying Glass.

A The Arteries. B The Veins of a Frogs Lungs prepared as above-mentioned. C Their Inosculations with each other. D . . . . The *Area* of the Microscope, as it appears to the naked Eye.

*Fig. 2.* Part of the hinder Foot of the young Frog viewed with the Microscope when living; whereby the different magnitude of the Extremities of the Arteries and Veins of the Lungs in the first Figure, and in this express'd at C C is very evident; The former being capable of admitting at least three Globules of Blood to pass abreast, whereas the Extremities of the Arteries and Veins in the Feet admit of one Globule of the Blood only to pass before the other. A A The Trunks of the Arteries. B B Those of the Veins lying by the side of the Toes. C C Their Extremities continu'd with each other, in the transparent Membrane between the Frog's Toes. *a a* Two of the Frog's Toes.

*Fig. 3. and 4.* The Extremities of the Arteries and Veins of a Frog's Lungs. A A The Arteries. B B The Veins. C C Their Conjunctions with each other. D The *Area* of the Microscope.

*Fig. 5.* One of the *Hexagon Areae* of a Frog's Lungs, which were not so much distended by Inflation, as those parts of the Lungs represented in the two former Figures 3 and 4, whereby the little *Areae* or Cells in the Interstices of the extremities of the Veins and Arteries appear closer and less than in the two foregoing Figures, tho' viewed by the same Microscope. A The Arteries. B The Veins. D The *Area*, which is more magnified at *Fig. the 1st*.

*Fig. 6.* The lower part of one of the Lobes of a Water Lizard's Lungs, as it appears by the Microscope, when the Blood is retained in the Extremities of the Vessels, as in the preceeding Figures. A A The Trunk of the Pulmonick Artery. B B The Vein. C C . . . Their Branches, joyning with each other. D D The transparent smooth Membrane, which in this Creature, is not vesiculated, or full of Cells, as in the Lungs of Frogs, on which the Blood Vessels are expanded; nor does the internal Surface of this Membrane differ from the External, as in Frogs and divers amphibious Creatures. The Lungs of these Water Lizards being vesicated, and not vesiculated.

8. Mr. L's Picture being so small, I thought my Sketches would not be unacceptable, because they not only confirm his account, but may contribute to give a more perfect Idea of so odd an Animal: I found it the beginning of *June* in some clear Water, which I took up in a Ditch in which, with my utmost attention, I could discover no more than this one of the same kind. *Fig. I.* represents it in one of the postures it appear'd the first day (for it varies every moment) and the knob at *a*, which lookt like the Gut *cæcum*, was sometimes a little more lengthen'd; two days after I could perceive two or three white Fibres at the end of it, and on the fourth

Remarks on a  
Letter of Mr.  
Lewenhoeck  
in n. 283.  
by ———  
n. 288. p. 1494.  
Plate 20.



Fig: 1.

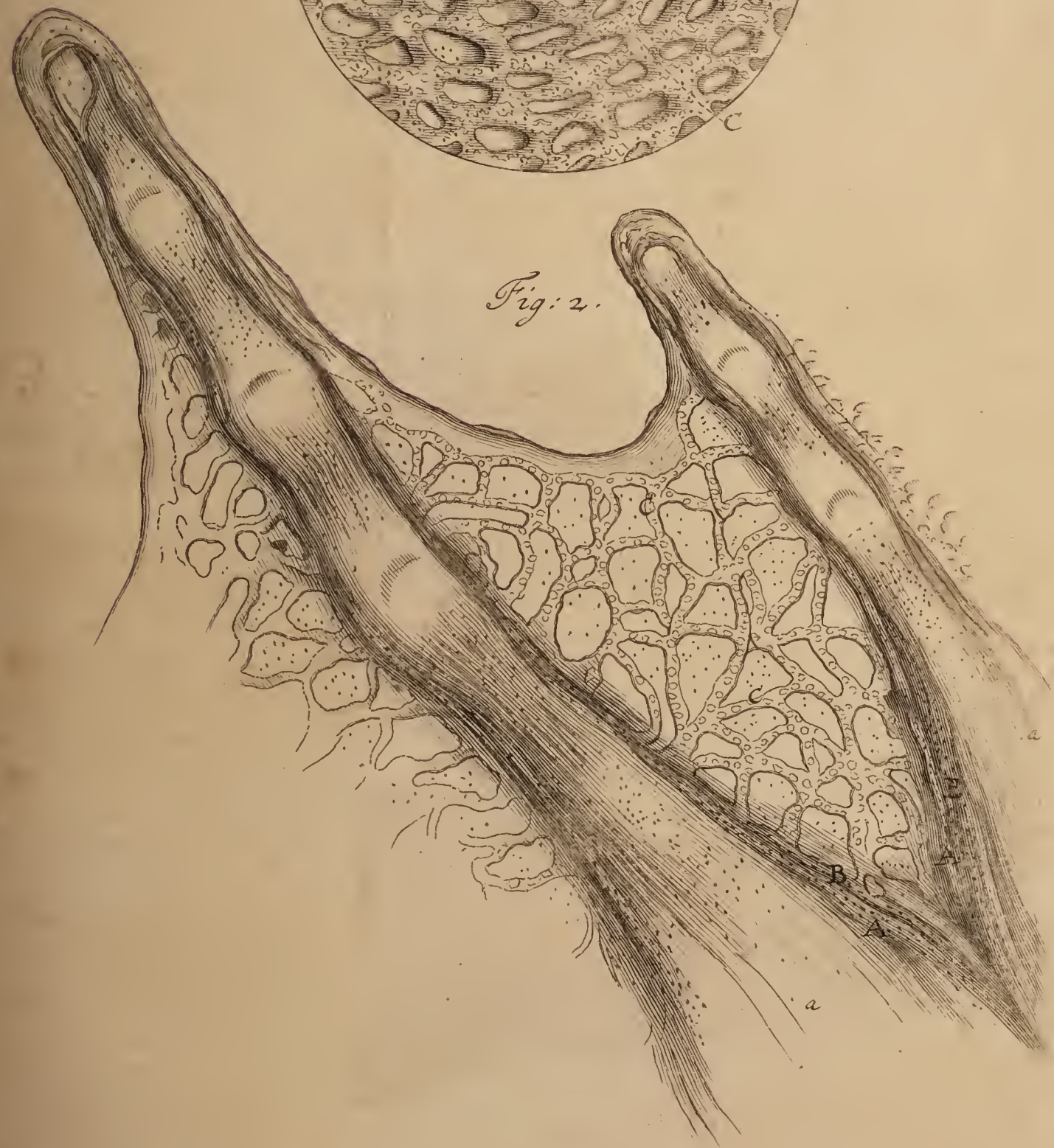


Fig: 3.



Fig: 4.



Fig: 5.

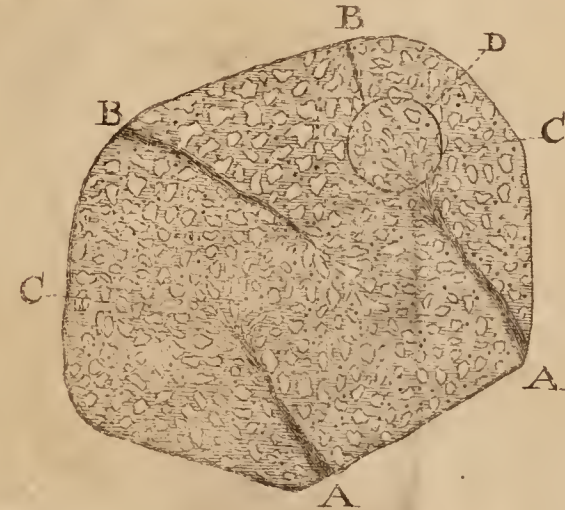
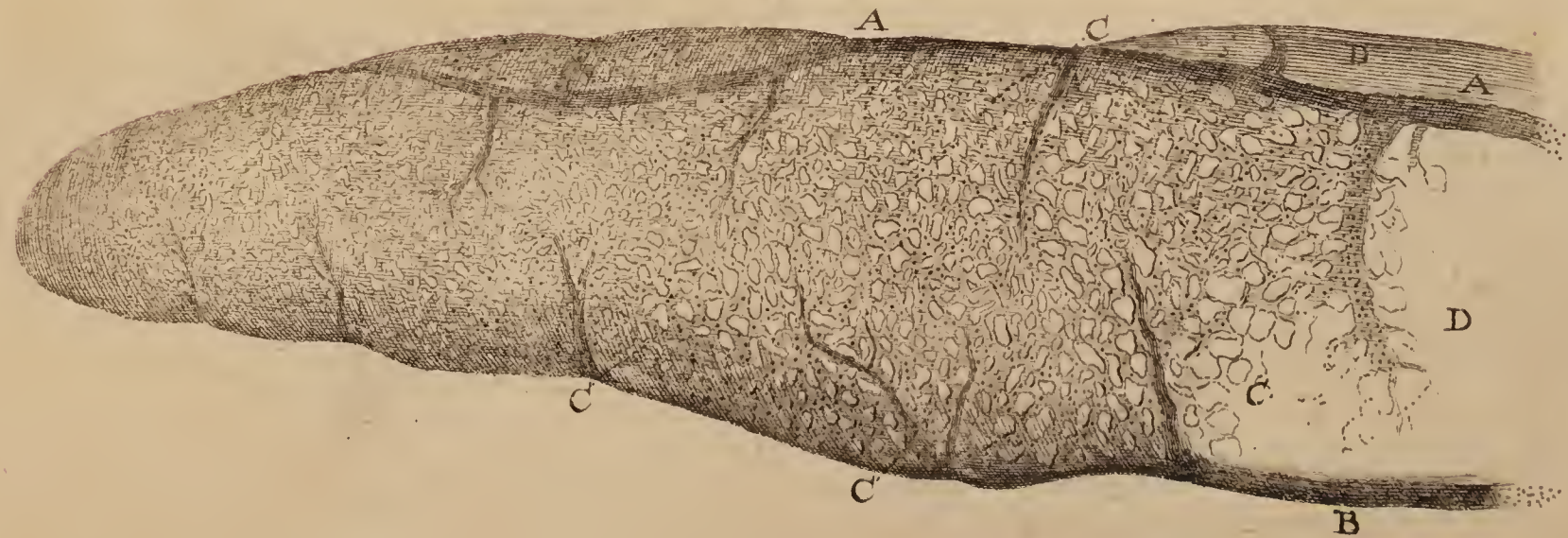


Fig: 6.



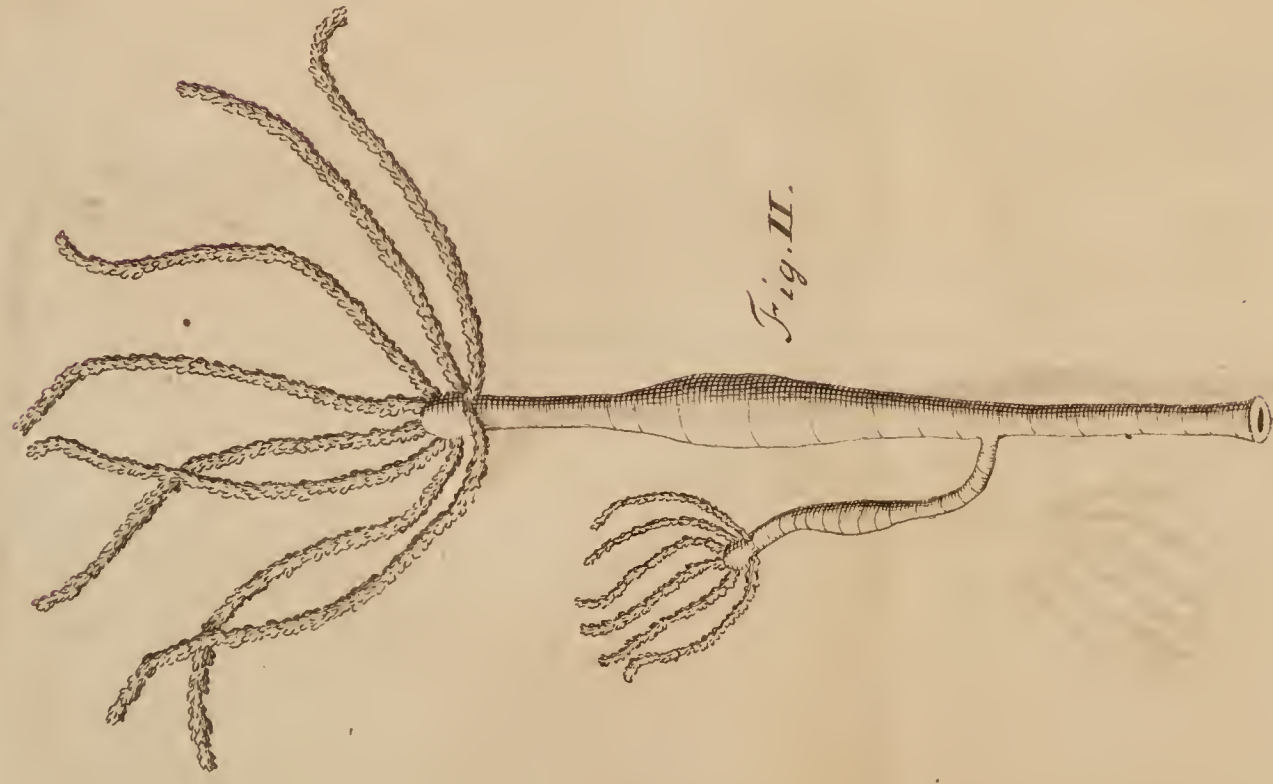












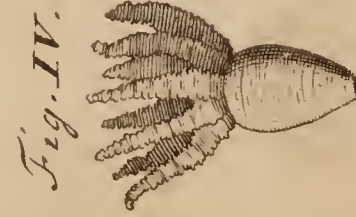
*Fig. II.*



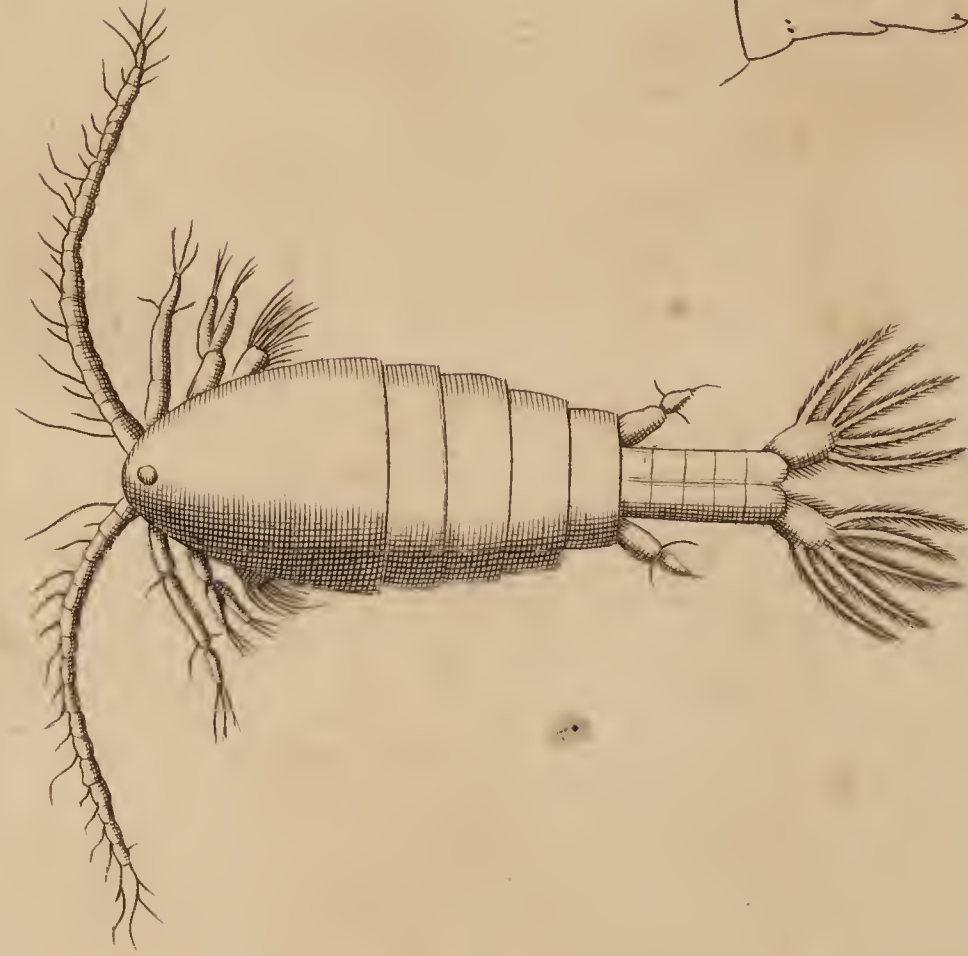
*Fig. III.*



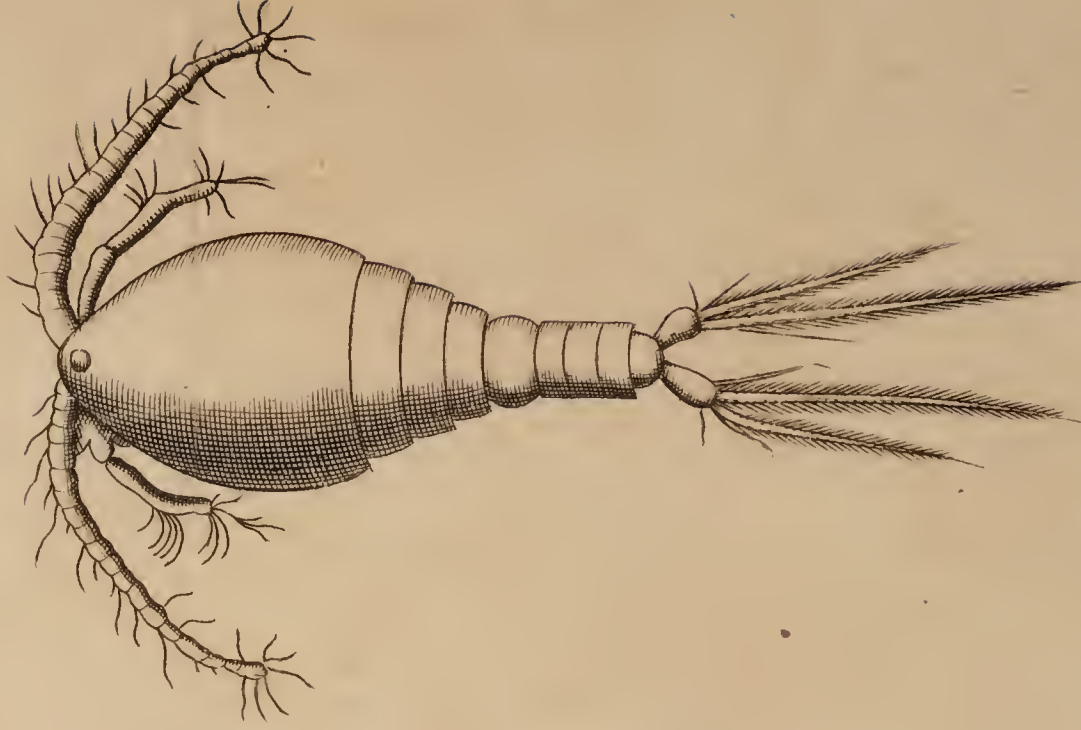
*Fig. I.*



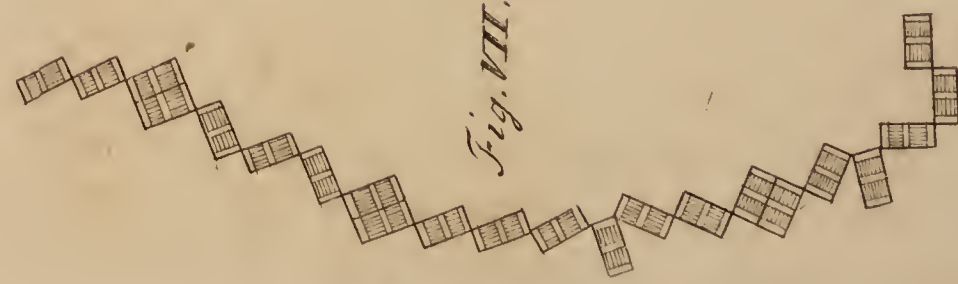
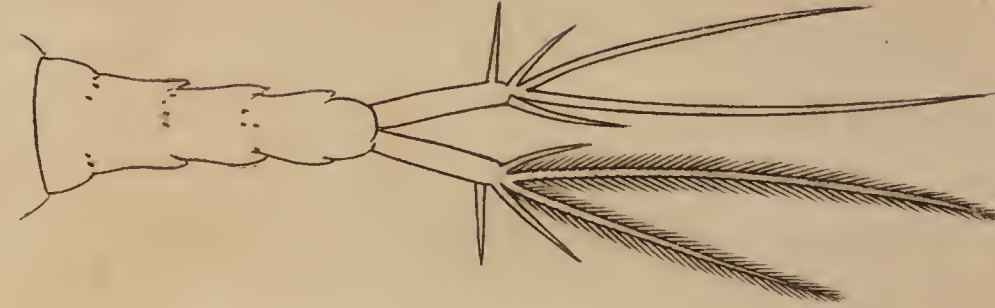
*Fig. IV.*



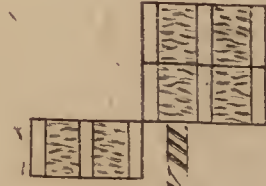
*Fig. VI.*



*Fig. V.*



*Fig. VII.*



*Fig. VIII.*



fourth day, the Animal lying stretch'd at its full length; appear'd as in *Fig. II.* and I plainly saw, that what I thought an excrescence was a young one, with 6 horns coming out of the side of the old one, and the next day I found it in the Water entirely separated from the body, and was about one third of the length of the Parent. The formation of the horns are well figur'd by Mr. *L.* and they issue (like *radij*) not from the extremity, but quite round a small knob, which I take to be the Head. The Horns have a vermicular motion, and are extended or shorten'd both altogether and severally. The other end is flat at the extremity, and he often fix'd it (like a *Leech*) to the bottom or side of the Glass in which I kept him. He also contracts and dilates his body at pleasure, and especially, when touch'd or disturb'd, will bring both Body and Horns into a small compass, and has then the appearance of *Fig. III.* and *IV.* The Horns are perfectly white, and the Body yellowish, and to a naked Eye not easily discernable in the Water, it being when extended no thicker than a good Horse-hair.

The small Plant there mention'd is the *Lens Palustris* or *Duck-meat*, which floats plentifully on our Ponds or Ditches. But I must dissent from Mr. *L.* where he says it does not come originally from the bottom, for I very well remember that many years since, I saw the manner of its springing out of the Mud; and we often observ'd, that when the Leaves were grown to a competent size, the force of the Water easily drew the minute single fiber'd Root, and rais'd the Plant to the Surface. I own that the Leaves when floating do continue to grow, and may be encreas'd after the manner he mentions, and I have often taken the young Plant which he pictures out of them, so that they may be call'd Seeds more properly than Leaves; and my opinion is, that toward the end of the year, upon their corruption, they sink to the bottom, and there take root, so as to continue the succession.

The *Animalcula* which Mr. *L.* describes sticking to the Root of the Plant, I have often observ'd not only in Water-Plants, but adhering to the bodies of many sorts of Water Insects, which I have seen cover'd all over with Tufts of them, each Tuft being made up of many *Animalcula*, which appear not much unlike to the Flowers of a Lilly or *Fox-Glove*. This Congeries of *Animalcula* will lengthen and contract themselves both altogether and severally, and I have observed them, when they lye at length, to put out some wonderfully minute Organs like small Feet (not easily discern'd even with my best Glasses) which by their quick agitation bring a current of Water from all sides toward them. But I was never so fortunate as to see that motion in them, which he says is like that of a Mill wheel; nor indeed can I perceive the possibility of such a Rotation of any Member in an Animal mechanism. But I think I can easily account for this mistake of Mr. *L.* or rather of his Painter; for in the same Water wherein I have seen these Plants and *Animalcula*, I have observed a small round Creature, whose many Legs stand like *radij* all about its Body.



This has a swift progressive motion, but will very often lye still (when only you can perceive those *radij*) and then turn very swiftly round like a Wheel, sometimes one way, and then stop and turn the other way, without stirring an hairs breadth forward. Now 'tis very probable that one of these might shew its tricks so very near to, or among a Tuft of the other fix'd *Animalcula*, that it might be very well taken for part of the same, and I am very confident this is matter of Fact.

These *Animalcula* are sometimes seen loose, but generally they are fix'd in clusters by their Tails to other Bodies, and perhaps cannot separate themselves; and I think it no mean instance of Providence, that many kinds of Water Insects which are so fix'd, and even some of which have but slow and irregular Motions, are furnished with such Organs about their Head, the vibration of which brings a constant current towards their Mouths, and with that, Food for their Support, otherwise they would be starv'd for want of Nourishment.

The Insects on whose Bodies I have seen these *Animalcula*, are of divers sorts, and I have observ'd no small variety in the Water of our Ditches, not only of Reptiles, and the Catter-pillar kind, but of Eels and perfect Shell-fish, both Crustaceous and Testaceous, and have been so pleas'd with the Beauty of some of them, that I have kept them many Weeks by me, as an agreeable entertainment for such as are curious; and farther design'd, if I could have met with a good hand in the Country, to have got some Figures of them, which I had attempted my self, but with no satisfaction. However, having preserv'd two tolerable Sketches of two sorts of the Crustaceous kind, I venture to send them you, since (tho' much to the disadvantage of their Beauty) they will give you a better Notion of them than any thing I can write. *Fig. V.* and *VI.* shews them as they lye with their back towards you in a swimming Posture, but the Members and Legs on the other side are so various, and so much more curiously form'd than those of Lobsters and Shrimps, that I despair'd of giving any tolerable representation of them in any other position. These are about the same size, the biggest being rather less than a very small Flea, and the least a little bigger than a Mite, but all are Breeders, and carry their Spawn at their Tail: that of *Fig. V.* in two Bags (one on each side) which are fasten'd about the fifth joyn't, and the other in a single Bag or Film under the Tail, and I have often seen these Bags broken, and the Spawn (which is globular and large in proportion to the Fish) scatter'd through the Water. There is also among these a third sort of the same kind, not less elegant, tho' far less in bulk, which is shap'd more like a Shrimp, and carries its Spawn like that, but I could never make any Figure of it worth preserving. One thing I had like to have forgot which is very remarkable, that all these three species (as also some other Water Insects) are certainly monocular, and have their Eye exactly in the middle of their head, and I could never with my utmost application find so much as a dividing Line in it. Some of them, especially in some Waters, are dark  
and



and cloudy, but they are generally so transparent, that through the Shell I can see the peristaltick motion quite through their whole length, and a constant pulsation of a part, which I guess is the Heart, but I could never discover any course of Blood in them (nor even in Shrimps themselves, which are as large as some thousands of these) tho' I have seen it plainly in Creatures a little bigger, viz. the smallest new hatch'd Spiders, and in that Water Insect which is describ'd and pictur'd (tho' not accurately) by *Swammerdam*, under the (very improper) name of *Pulex aquaticus*. But this is of the Testaceous kind, of which I have seen a greater variety (and not less curious) than of the Crustaceous.

I have farther observ'd the *Lens palustris*, and am fully satisfy'd of the truth of its first springing from the bottom. I lately took up some on the shallow side of a Pond, and found the ends of the Stalks (most of which were at least 5 inches long, and as thick as a strong Horse-hair) manifestly radicated in the bottom, so that I could not take them up without raising the Mud with them, which also adhered very visibly to them. These Stalks or Roots are of a curious Texture, and almost transparent, and I have seen their out-side very prettily cover'd with a regular sort of Net-work.

In my Observation of these Stalks, I often saw adhering to them (and sometimes separate in the Water) many pretty branches, compos'd of rectangular Oblongs and exact Squares, which were joyn'd together, as you may see in *Fig. VII.* which I drew as exactly as I could from one of them. There are often twenty or more of these Figures in one branch, which generally adheres at one end to the Stalks of the Plant, and I think it remarkable that these rectangular Parallelograms are all of the same Size, the longest side exceeds not  $\frac{1}{5}$  of an Hairs breadth, and that the Length is just double the Breadth, the Squares being visibly made up of two Parallelograms joyn'd longwise. They seem very thin, and the Texture of every one is nearly the same. To a very large Magnifier they appear as in *Fig. VIII.* I took these Branches at first for Salts, but finding them always of the same Size, and that there was no sensible encrease of their Bulk while they continued in the Water, that after they had lain a day or two dry on a Glass Plate, they alter'd not their Figure, and upon the addition of new Water (warm or cold) they had still the same appearance and cohesion, and that their adherence (tho' touching only in the angular Points) was so firm and rigid, that all mov'd together, and kept the same position in respect of one another, however agitated by the Water; these considerations, I say, persuade me, that they may be rather Plants than Salts, but they being so very minute that no judgment can be made of 'em but by the Eye, I shall not determine any thing positively.

In some Water which I took out of a Pit, I found a small Water Newt, not an Inch long, which I suppose was of this years hatch, and the Legs being so small as not readily to be discern'd at first view, and the body very clear, I took it at first sight for a Fish. This I kept by

me:



me (in lieu of Tadpoles) to shew the Circulation of the Blood in its Tail. But that was not the only entertainment it gave me, for I found the Course of the Blood in every part of its Body, and particularly in every digit of the Feet, it was a curious sight to observe the Stream come to the extremity of the Toe in one Channel, and return by another. In this Newte just below the setting on of the Head on each side are three little rugged fleshy Branches, which he spreads like Fins, and which help to poise his Body. Observing these with the Microscope, I found each of them divided (something like a Leaf of Polipody) into a great many pointed Branchings, in each of which (as in Toes) I can see the Blood come to the extream Point on one side, and return on the other; and this is the more entertaining, because thirty or forty of these Branchings will sometimes appear to one view, and the Blood be seen distinctly circulating in all. For as Mr. *Cowper* rightly observes, the Globules of the Blood of these Creatures are very large, so that I can see the Circulation in them very well, even with the smallest Magnifiers, which take in a great *Area*. And from what has been said of this course of the Blood, I am perswaded, that these Organs in the Newte are not only design'd to be serviceable in their swimming, but (tho' they have Lungs like a Frog) may be also analogous to the Gills in Fishes.

In my Examination of the Waters of our Ditches (in which I daily find new Varieties of *Animalcula*) I had the good Luck to meet with great numbers of those round Bodies, mention'd by Mr. \* *Leeuwenhoeck*, which are there so well described, that I should not have again spoke of them, only that I saw a very surprizing Phœnomenon while I was observing them. Each of these spherical Bodies (which are smaller than a Mustard Seed) have a constant progressive Motion, and at the same time a slow Revolution about their own Axe, and contain within them other small Globules, some more, some less, but I never found above ten in any one, and these I have seen move and change their Position within the other, which Mr. *L.* says he never observ'd. While I had one of these Bodies on a Glass Plate before my Microscope, I saw (as he describes it) one of the contain'd Globules slip out of it, and while the great one lay still, for want of sufficient depth of Water to float in, this little one that came out had immediately a very quick Rotation on its Axe; and what was most surprizing, at the same time it kept an equable Revolution about the bigger Globe as the center of its Orbit, always very nearly at the same distance, tho' I could not perceive any Vortex in the Water which bore it; and what is yet more remarkable, I saw it stop, and then make its Revolution round the central Body the contrary way, the Rotation on its own Axe always continuing. And when the Water was so far evaporated that all lay at rest, by the addition of new Water the same Motions were renew'd. This I thought a very pretty representation of the Planetary Motions about the Sun, and I doubt not but a *Cartesian* Philosopher would not have been a little pleas'd, to see in Nature such

\* *Ph. Transf.*  
n. 261.



such an instance of such Revolutions of an inanimate Body in such a medium as Water. Indeed I think it not easy to account for these Motions of these Globules, nor will I to solve the Difficulty say in contradiction to Mr. *Leeuwenh.* that I believe them animate, tho' I have formerly seen some not very unlike them both in Shape and Motion, which I am satisfy'd are Animals. I find all the Earwigs which I have examin'd by a Microscope, infested with great numbers of minute Insects, which stick like Lice on many parts of their Bodies, and especially just under the setting on of their Head. They are alike on all, and I never found the same on any other Animal, they are white and shining like Mites, but much smaller, are round back'd, flat belly'd, and have long Legs, especially the two foremost.

XIII. 1. Marmor debet esse politum sine omni macula; durum, ut Ignis vim eo melius sustineat, ideo Alabastrum his usibus minime idoneum. *A Way to colour Marble. n. 268. p. 375.*

2. Ad aperiendos poros igne opus est, tali tamen gradu, ne igniatur, nam tum colores comburuntur; nec nimis tepido, nam etsi tum Colores recipiat, recepti tamen minus figuntur, nam marmor etiam frigidum imbibet aliquot colores, sc. Crocum *Stone-blue* pro Colore cœruleo, verum hi colores facillime per minimum calorem igne dissipantur, ideo is ignis sit Gradus qui sufficiat liquori marmoris infuso leniter ebulliendo.

3. Menstrua varia sunt, pro diversitate materiæ dissolvendæ, Lixivium ex Urina equina factum cum cineribus clavellatis, part. 4. & calcis viv. part. 1. (NB. Urina Canina præstat equinæ.) Item Spiritus Vini, Lixivium commune, Vinum & quædam Oleaginosa.

4. Colores qui cum vehiculis inducuntur hi sunt. 1. *Stone-blue*, in Spirit. Vin. vel Lixivio calcis viv. solut. 2. Lackmus in lixivio vulgari. 3. Crocus vel Sappgreen solutum cum lixivio ex Urina & Calc. viv. vel in Sp. Vini. 4. Vermilion vel Cochineel dissolut. ut supra. 5. Sang. Draconis in Sp. Vini S. Art. solut. 6. Brasilium lignum in Sp. Vini solut. 7. Radix Alcannæ cum oleo Terebinth. extract. nam in nullo alio menstruo nec Spiritu Vini nec in Lixivio solvitur. 8. *Sappgreen the less* mixt. & dissolut. in Sp. Vini vel lixivio calc. viv. ut antea. Aliud Genus Sanguinis Draconis est quod vocatur Lachryma Sanguinis Draconis, quod cum Urinis mixtum gratum satis producit colorem, verum ægre acquiritur; melius Colores cum Urina mixti finem non eludunt.

5. Colores qui sine vehiculo illinuntur hi sunt. 1. Sang. Draconis optime mundat. ad Colorem rubrum. 2. Gumm. Gutt. ad Col. flav. 3. Cera virid. ad Color. virid. 4. Sulphur, Pix, Terebinth. ad Colorem brunum requiritur tantummodo ut Marmor rite ferveat, & ita Colores grumatici fricando inducuntur, quod experientia docebit.

Hi Colores vel facile vel difficulter eluuntur; ruber Color cum oleo Tartari per deliquium intra 26 horas extrahitur sine ulla polituræ jactura; Brunus cum aqua forti intra quartam horæ partem, sed læsa politura.



Pro Colore Aurco sic fac. R. salis armoniaci, Vitrioli albi, flor. virid. æris, pulveriscentur subtilissime.

*Papers Omitted.*

n. 307 p. 1282. XIV. 1. An account of what Manuscripts were left by Mr. *John Ray*.  
By Mr. *Samuel Dale*.

n. 273. p. 898. 2. An account of Books printed and reprinting in *Italy*.  
& n. 276. p.  
1041.

*Letters and other Papers by Mr. Lewenhocke omitted.*

n. 268. p. 739. XV. 1. Farther Observations on the *Animalcula in Semine Masculino*.

n. 269. p. 786. 2. Concerning Excrescences growing on Willow Leaves, &c.

n. 270. p. 821. 3. Of the Spawn of Codfish, &c.

n. 272. p. 867. 4. Concerning Spiders, &c.

n. 273. p. 899. 5. Of the Cause of different Tastes of Waters and Edge of Razors.

n. 279. p. 1137. 6. Of the *Animalcula in Semine Masculino* of Cocks, Spiders, Shortness of Breath, &c. and Rain Water.

n. 283. p. 1404. 7. Of the Animalcules found on green Weeds grown in Water.

n. 286. p. 1430. 8. Of the Animacules in Water, the Dissolution of Silver, &c.

n. 287. p. 1461. 9. Of the Seeds of Oranges, &c.

n. 289 p. 1522. 10. Of Worms in Sheeps Livers, & Pasture Grounds.

*Ibid.* p. 1537. 11. Of the Figures of Sand.

n. 292. p. 1614. 12. Of Cochineel.

n. 293. p. 1723. 13. Of the Flesh, &c. of Whales, of the *Chelidonium majus*, and of Tobacco Ashes.  
1730, 1740.

n. 294. p. 1774. 14. Of some Fossiles of *Switzerland*.

n. 295. p. 1784. } 15. Of *Animalcula* on the Roots of Duck Weed, &c.  
n. 337. p. 160.

n. 295 p. 1794. 16. On staining the Fingers with a Solution of *Aqua Fortis*.

n. 296. p. 1843. 17. On the Barks of Trees.

*Ibid.* p. 1856. 18. On the vitrify'd Salts of calcin'd Hay.

n. 297. p. 1868. 19. On the Seeds and Seed Vessels of *Polypodium*.

n. 298. p. 1906. 20. Of the Figures of the Salts of Chrystal.

n. 304. p. 2158. 21. Of the Pumice Stones, Corals, Sponges, &c.

n. 305 p. 2205. 22. Of the Seeds of several *East-India* Plants.

n. 307. p. 2305. 23. Of the Structure of the Spleen, and the *Robonis* of a Flea.

n. 311. p. 1206. 24. Of the Salts of Pearls, Oyster Shells, &c.

*Ibid.* p. 2425. } 25. Of the Particles of Silver dissolv'd in *Aqua Fortis*.  
n. 325. p. 20.

n. 312 p. 2446. } 26. On the *Cortex Peruvianus*, and the Whiteness of the Tongue in  
& 1456. & n. } Fevers.  
318. p. 210.

n. 314. p. 53. 27. On the Blood Vessels and Membranes of the Intestines.

n. 315. p. 111. 28. On the Tongue.



29. On red Coral. n. 316. p. 126.  
 30. On the Circulation of Blood in Fishes, &c. n. 319. p. 250.  
 31. Of the Palates of Oxen, &c. n. 320. p. 294.  
 32. Of the Particles of chryſtalliz'd Sugar, and his manner of observing the Circulation of Blood in an Eel. n. 323. p. 444.  
 33. Of the Configuration of Diamonds. n. 324. p. 479.  
 34. On the Edge of Razors. Ibid. p. 493.  
 35. Of the *Animalcules in Semine* of young Rams. n. 331. p. 386.  
 36. Of the Production of young Mites. n. 333. p. 398.  
 37. Of the Seminal Veſſels, Muſcular Fibres and Blood of Whales. n. 334. p. 438.  
 38. On the Contexture of the Skin of Elephants. n. 336. p. 518.  
 39. On Muſcles, and the manner of their Production. Ibid. p. 529.  
 40. On the ſmall Fibres of the Muſcle in ſeveral Animals. n. 339. p. 55.

*Accounts of Books omitted.*

XVI. 1. *Lexicon Technicum*; or an univerſal Engliſh Dictionary of Arts and Sciences. By Dr. John Harris, Fol. n. 292. p. 1999.

2. *Apicii Cœlii de Opſoniis & Condimentis, ſive Arte Coquinaria, Libb. X.* n. 294. p. 1782.  
*Cum Annotationibus Martini Liſteri, M. D. & variis Lectionibus integris Humelbergii, Barthii & variorum, 8vo. Lond. 1705.*



*The following List of the Philosophical Transactions and Collections, and the Years wherein they were printed, may be of Service to such Readers as are desirous to know the particular Time when any Tract therein publish'd was written.*

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